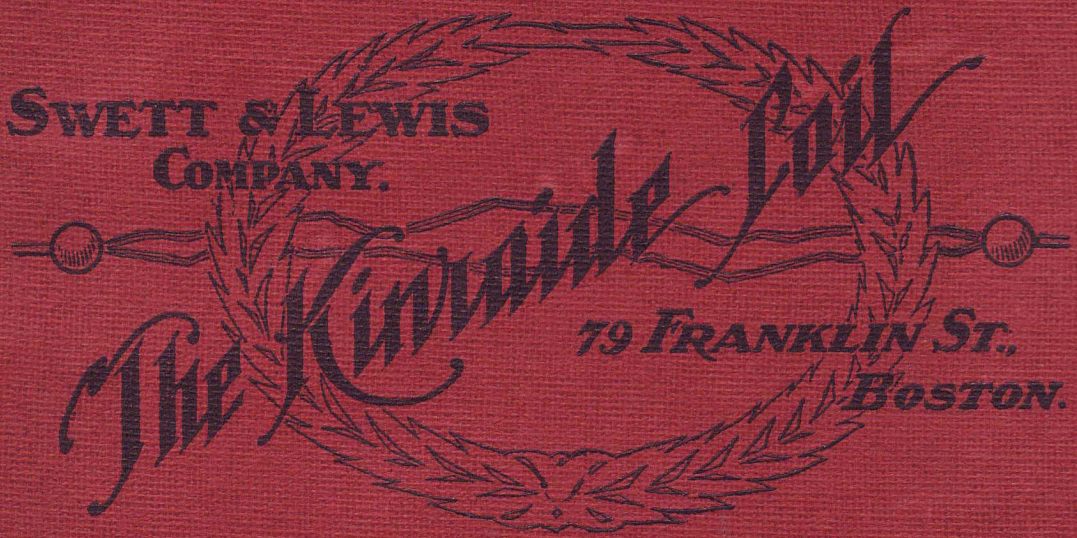
Private


Swett & Lewis
Company.
The Kinnaide Coil
79 Franklin St.,
Boston.

SWETT & LEWIS
COMPANY.
The Kinraide Coil
79 FRANKLIN ST.,
BOSTON.

WE ARE PLEASED TO ANNOUNCE THAT WE ARE SOLE SELLING AGENTS FOR THE KINRAIDE COILS, WHICH HAVE NOT UNTIL NOW BEEN MADE ON AN EXTENDED SCALE, THE FEW BUILT IN THE LABORATORY OF THE INVENTOR, MR. THOMAS B. KINRAIDE OF JAMAICA PLAIN, MASSACHUSETTS, HAVING WON UNSTINTED PRAISE. MR. HOWARD JACKSON, THE WELL-KNOWN ELECTRICAL ENGINEER WHO HAS MANUFACTURED OUR GOODS FOR SEVERAL YEARS, HAS SECURED THE SOLE LICENSE TO MANUFACTURE UNDER MR. KINRAIDE'S PATENTS.

The Kinraide Induction Coil

THE Rhumkorff Coil, with its many miles of fine wire wound in thin sections, a hundred or more of which are necessary for a twelve-inch spark coil, is the starting point from which the Kinraide Induction Coil was developed. This coil consists of two separate secondaries with their primaries connected in series. Each secondary has a high and low potential terminal due to the position and the method of winding the primary. The primary is located *outside* the secondary winding. The secondaries are wound in single flat discs and lie in the same plane as the primaries; with this method of construction the discharge from the two terminals is vastly different.

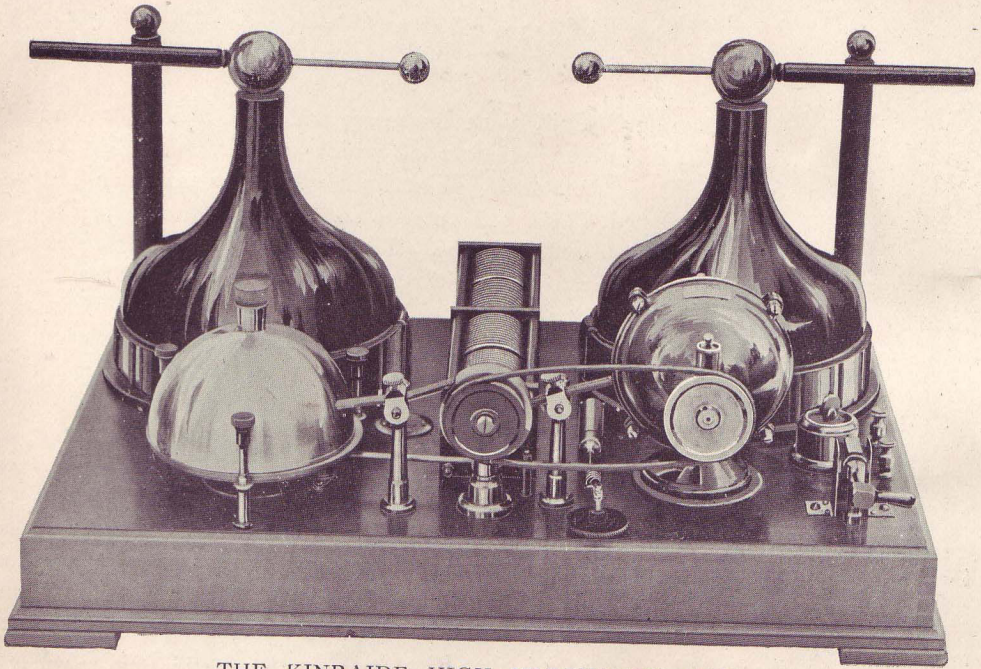
WINDING

The potential at the central terminal of the secondary is extremely high, whilst that of the outer turns near the primary is very low. By connecting the outer terminals of two such secondaries in series the potential of the outer turns entirely disappears.

A UNIQUE FEATURE

This unique feature is of the utmost importance, as there is no tendency to discharge into the primary, a most deplorable weakness of the Rhumkorff Coil, and most expensive, since, if the primary tube is punctured, the coil is practically ruined. The secondary of the Kinraide Coil is not subject to any such danger.

Another weak feature of the Rhumkorff Coil is the heat developed in the primary. Outside the wall of the primary tube, and in contact with it, is the



THE KINRAIDE HIGH FREQUENCY COIL

insulating compound. The least increase of temperature in the primary softens this and before danger is suspected, it has melted, and no safe operation can thereafter be assured.

ABSENCE OF HEAT

There is absolutely no heating in the primary of the Kinraide Coil, so that the insulation cannot be melted, nor is there heat generated where it can in any way affect this delicate part of the apparatus.

In the above, the Rhumkorff Coil is used for comparison only, and not to depreciate its value, after long years of service as an inseparable part of a well-equipped laboratory.

SPARK GAP

HIGH FREQUENCY

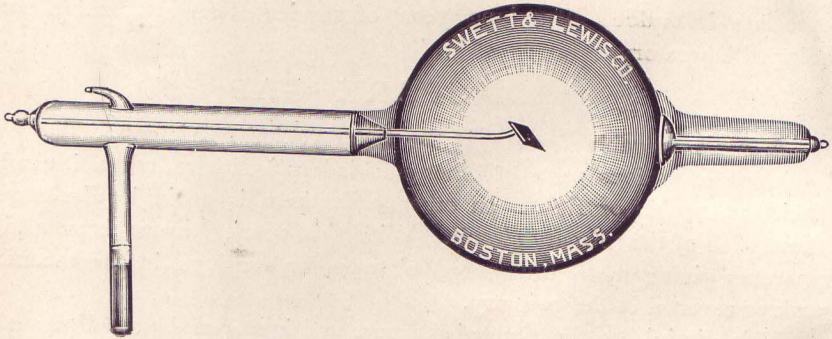
A most valuable feature is the water cooled spark gap. The heat ordinarily developed in various parts of other coils is localized here, where it can be taken care of without trouble or risk. In other coils there is a single discharge from every interruption of the primary circuit. With this spark gap we have a high frequency apparatus giving many hundred discharges, or surgings, in the secondary for every break or reversal in the primary.

DISCHARGE

This diminishes the time of exposure and increases the steadiness of the illumination of the screen. The appearance of the discharge is wholly different from the Rhumkorff spark, and must be seen to be appreciated.

IMPROVED INTERRUPTER

A vexatious feature of the old apparatus was the constant attention required by the vibrator. The sticking of the platinum points and the cost of their renewal is



TYPE K FOR DIRECT CURRENT USE

entirely eliminated by the new rotary break, which will easily handle sufficient current without noticeable sparking.

DURABILITY

This interrupter is a most solid and durable thing, and with the spark gap embodies an entirely new principle. It is as durable as any part of the coil, and when started runs at constant speed until the motor is stopped. The alternating coil requires no interrupter. The spark gap, however, is essential.

PORTABILITY

LIGHT WEIGHT

The use of so little wire in the coil makes the apparatus compact, strong and readily portable. The whole outfit may be taken in the physician's buggy. In hospitals it may be placed upon a small table and moved from ward to ward. The weight of the coil complete is from sixty-five pounds to seventy-five pounds.

SMALL AMOUNT OF CURRENT USED

This apparatus consumes three to four amperes. It can be attached to any lamp socket, and is also constructed for use with storage batteries.

SHORT EXPOSURES

SUCCESSFUL TESTS

For X-ray fluoroscopic work great steadiness of illumination is necessary; also energy enough to brilliantly illuminate the screen. For radiographs it is essential that the time of exposure be not very long; in fact a great amount of detail in the finished negative is often sacrificed on account of difficulties attending a prolonged exposure. All these valuable effects are obtainable in this new apparatus, which has been put to

most severe tests in both private and hospital work for the past two years, and is highly recommended by the users.

The following table of exposures will be found to meet the requirements in the average case, with a normal distance and a plate of the ordinary speed.

FOR ADULTS

Chest	3 minutes	Pelvis	5 minutes
Shoulder	3 minutes	Hip	5 minutes
Elbow	15 seconds	Knee	60 seconds
Wrist	5 seconds	Ankle	15 seconds
Hand	3 seconds	Foot	5 seconds

SUMMARY OF ADVANTAGES

RELIABILITY

A summary of the advantages of the Kinraide Coil are portability, safety of operation, simplicity of construction, durability, small amount of current used in operating, steadiness of illumination of fluorescent screen, a greater amount of X-ray light than from any other apparatus using anything like the same amount of current, always ready for work in all weathers, no sparking into the primary, no melting of the solid insulation of the secondary, easily and cheaply repaired, no platinum points, no breaking down of the condenser, and a much shorter time of exposure than has been before obtained.

TUBES

Our tube at first sight is not different from the ordinary X-ray tube. It is, however, carefully constructed upon accurate measurements made from, and according

to the requirements of this coil. The curvature and size of the cathode, its distance from the anode, and the proper vacuum have all been experimentally determined and incorporated into its structure. The alternating current tube is a new departure, and is the outcome of years of experiment, and is unequalled for definition.

VACUUM ADJUSTER

Too much stress cannot be laid upon the necessity of having a suitable tube, as therein lies the secret of the best work. All of our tubes for coil use are fitted with our special vacuum adjuster, by which the vacuum can be held at any point with ease. It has been a difficult problem to successfully design a tube to resist the energy developed by the Kinraide Coil, many methods having been tried with varying success.

HEATING CONTROLLED

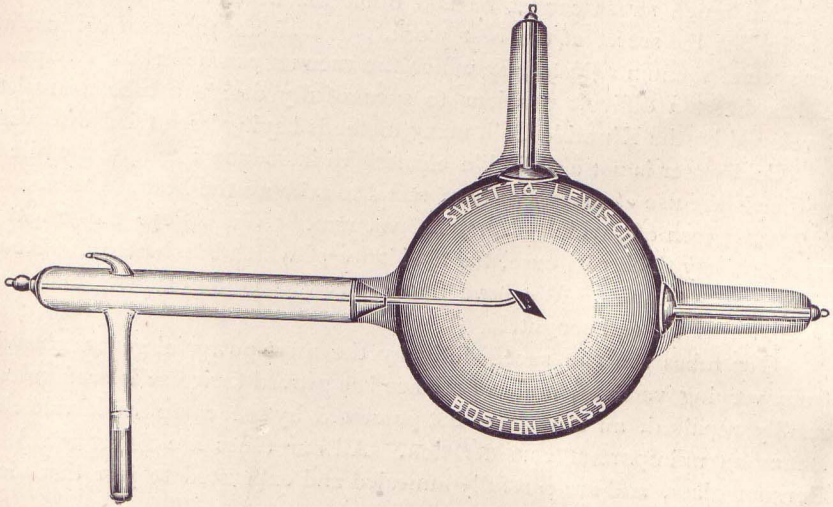
Cold water is not a desirable element to introduce into a tube while in operation; neither is the use of masses of base metal to take up the heat advisable, on account of the gases given off, which change the vacuum. We believe the proper method is to use extremely thick platinum, the avoidance of which has heretofore been the object of many manufacturers. We have found that this is the surest, and best method to acccomplish the end sought.

ECONOMY

Our tubes are run successfully by the most powerful generators with no trouble from varying vacuum, and experience has proved their use is economical. They are readily repaired, an advantage not possessed by the complicated varieties, and by no means an unimportant consideration. All our tubes are *hand made* from the best German glass, and are carefully annealed and exhausted to just that nice point which gives the best results.

TERMINALS

Our terminals are worthy of commendation. We are proud of the mechanical design of our tubes, and extended use shows that they have ample strength exactly where needed. In short, our aim has been to avoid complication of all kinds, and the accompanying cuts show how well we have succeeded.



TYPE H FOR ALTERNATING CURRENT USE

TUBE STANDS

SIMPLE

Our experience has shown us that the present tube-holders on the market leave much to be desired for practical every-day work. After much experimenting we have produced a floor stand that is not complicated, has all needful adjustments, is sufficiently rigid, and looks well.

ADJUSTABLE

An adjustable spark gap for tube regulations is a valuable feature, and this addition takes up no extra space. The only metal used is the cast iron base. The tubes and wires are well insulated with the best hard rubber, thus increasing the efficiency of the whole apparatus.

PRICE LIST

COILS

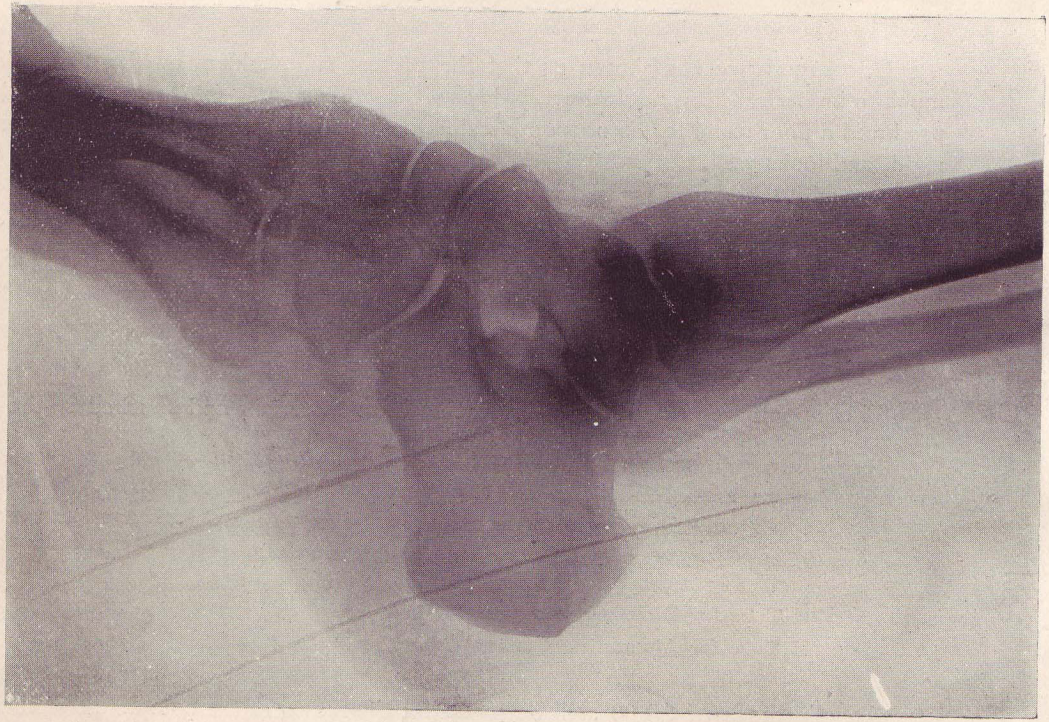
This apparatus is constructed from the finest materials and finished in the best possible manner. No second grade is made.

The Kinraide Induction Coil . . . Net	$200.00
(Direct and alternating currents of all voltages from 20 to 500)	

TUBES

K Tube for Direct Current Coil	15.00
H Tube for Alternating Current Coil only . .	18.00

An allowance of $3.00 will be made for the return of the complete terminals of either of the above tubes towards the price of new apparatus.



FIFTEEN SECONDS EXPOSURE

FLUOROSCOPES

Platinum Barium Cyanide Fluoroscope, 4 x 5	8.00
Platinum Barium Cyanide Fluoroscope, 5 x 5	10.00
Platinum Barium Cyanide Fluoroscope, 5 x 7	12.50
Platinum Barium Cyanide Fluoroscope, 6 x 6	13.00
Platinum Barium Cyanide Fluoroscope, 6 x 8	16.00
Platinum Barium Cyanide Fluoroscope, 8 x 10	24.00

QUALITY

The Platinum Barium Cyanide, from which these screens are manufactured, is crystalized and re-crystalized before the cardboard is coated; afterwards a protecting varnish is applied, which makes them, in our opinion, the best screens in the country today. These screens are brilliant and lasting, and of very fine grain.

Tungstate of calcium screens will be furnished if desired. These are much cheaper, but we do not recommend them for ordinary work. Price list on application.

X-RAY PLATES

5 x 7, per dozen	$1.40
6½ x 8½, per dozen	2.30
8 x 10, per dozen	3.40
10 x 12, per dozen	5.50
11 x 14, per dozen	7.00
Complete developing and printing outfit, with full instructions for use	5.00

A supply of the above sizes always in stock. These plates are specially wrapped in light proof paper, no plate holder being required for use with the X-ray.

POSITIVE DISCHARGE FROM KINRAIDE COIL (Reduced)

FLOOR TUBE STAND

Floor Tube-Stand, with Adjustable Spark Gap	$10.00
A finely polished quartered oak table large enough for either of the foregoing outfits, and equipped with ball-bearing castors	12.00

SAMPLE OUTFITS

OUTFIT NUMBER TWENTY-ONE.

FOR DIRECT CURRENT—

One (1) Direct Current Kinraide Coil	$200.00
Two (2) Tubes, Type K	30.00
One (1) 5 x 7 Platinum Barium Cyanide Fluoroscope	12.50
One (1) Floor Tube-Stand, with adjustable Spark Gap for controlling vacuum	10.00
Total	$252.50

OUTFIT NUMBER TWENTY-TWO

FOR ALTERNATING CURRENT—

One (1) Alternating Current Kinraide Coil	$200.00
Two (2) Tubes, Type H	36.00
One (1) 5 x 7 Platinum Barium Cyanide Fluoroscope	12.50
One (1) Floor Tube-Stand, with adjustable Spark Gap for controlling vacuum	10.00
Total	$258.50

In ordering coils give voltage of circuit, whether direct or alternating; if alternating, the number of alternations.

Full directions for operating accompany each coil.

We want our customers to feel perfectly free at all times to call upon us for expert advice on all things pertaining to the operation of X-ray outfits.

The factory where our goods are manufactured is well equipped with the finest tools and latest facilities for our business.

CATALOGUES

If interested in static machines and electro-therapeutical apparatus in general send for Bulletin Number Twenty-Four. Static tubes, Bulletin Number Twenty-Five.

TERMS

Prices in this catalogue are net.

Remit by money order, express or by New York draft. Add twenty-five cents to face of all checks except on New York or Boston, to cover collection charges.

REFERENCES

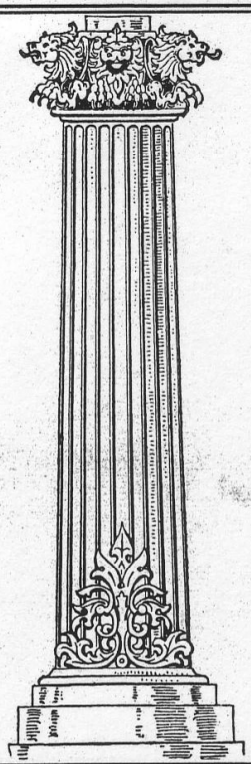
Customers unknown to us must give satisfactory references, or send cash with order, for which we will allow five per cent. We will ship C. O. D., provided a remittance of twenty per cent. accompanies order. Charges for return of money to be borne by purchaser.

Goods will be delivered f. o. b., freight or express, Boston, Mass. No charges for packing. Each piece of apparatus is carefully packed and no allowance will be made for loss or breakage in transit.

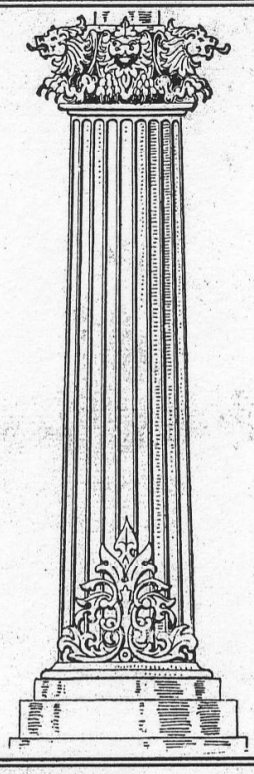
PRESS OF MURRAY AND EMERY COMPANY
BOSTON

SWETT AND LEWIS
COMPANY
THE KINRAIDE COIL
18 BOYLSTON STREET
BOSTON

SWETT AND LEWIS COMPANY



BULLETIN
NUMBER
TWENTY-EIGHT



NUMBER EIGHTEEN BOYLSTON STREET
BOSTON MASSACHUSETTS, U. S. A.

WE ARE PLEASED TO ANNOUNCE THAT WE ARE SOLE SELLING AGENTS FOR THE KINRAIDE COILS, WHICH, PREVIOUS TO JUNE, 1901, WERE NOT MADE ON AN EXTENDED SCALE, THE FEW BUILT IN THE LABORATORY OF THE INVENTOR, MR. THOMAS B. KINRAIDE, OF JAMAICA PLAIN, MASSACHUSETTS, HAVING WON UNSTINTED PRAISE. MR. HOWARD JACKSON, THE WELL-KNOWN ELECTRICAL ENGINEER, WHO HAS MANUFACTURED OUR GOODS FOR SEVERAL YEARS, HAS SECURED THE SOLE LICENSE TO MANUFACTURE UNDER MR. KINRAIDE'S PATENTS

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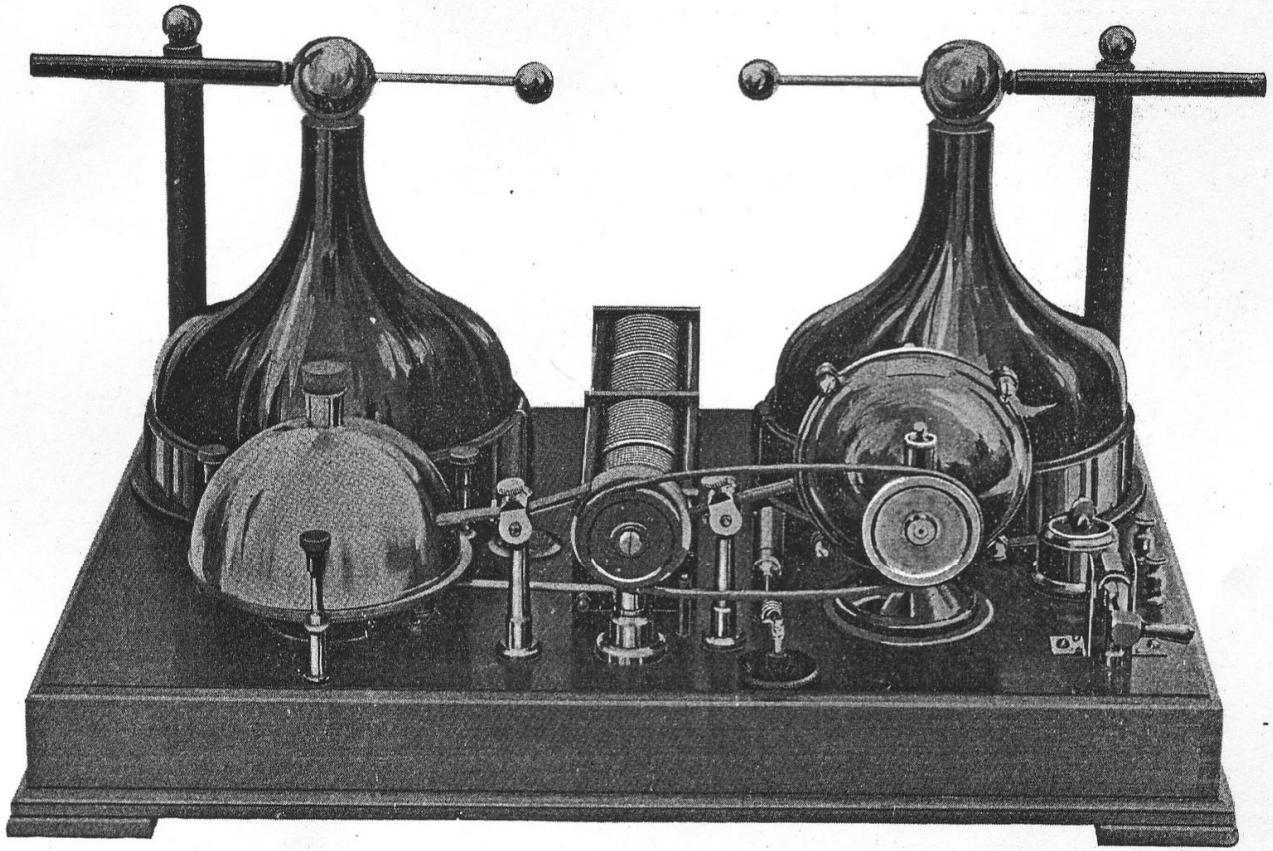
THE Rhumkorff Coil, with its many miles of fine wire wound in thin sections, a hundred or more of which are necessary for a twelve-inch spark coil, is the starting point from which the Kinraide Induction Coil was developed. This coil consists of two separate secondaries with their primaries connected in series. Each secondary has a high and low potential terminal due to the position and the method of winding the primary. The primary is located *outside* the secondary winding. The secondaries are wound in single flat discs and lie in the same plane as the primaries; with this method of construction the discharge from the two terminals is vastly different. The potential at the central terminal of the secondary is extremely high, while that of the outer turns near the primary is very low. By connecting the outer terminals of two such secondaries in series the potential of the outer turns entirely disappears.

A UNIQUE FEATURE

This unique feature is of the utmost importance, as there is no tendency to discharge into the primary, a most deplorable weakness of the Rhumkorff Coil, and most expensive, since, if the primary tube is punctured, the coil is practically ruined. The secondary of the Kinraide Coil is not subject to any such danger.

Another weak feature of the Rhumkorff Coil is the heat developed in the primary. Outside the wall of the primary tube, and in contact with it, is the insulating compound. The least increase of temperature in the primary softens this, and before danger is suspected, it has melted, and no safe operation can thereafter be assured.



THE KINRAIDE HIGH FREQUENCY COIL, DIRECT CURRENT

ABSENCE OF HEAT

There is absolutely no heating in the primary of the Kinraide Coil, so that the insulation cannot be melted, nor is there heat generated where it can in any way affect this delicate part of the apparatus.

In the above, the Rhumkorff Coil is used for comparison only, and not to depreciate its value, after long years of service as an inseparable part of a well-equipped laboratory.

SPARK GAP

HIGH FREQUENCY

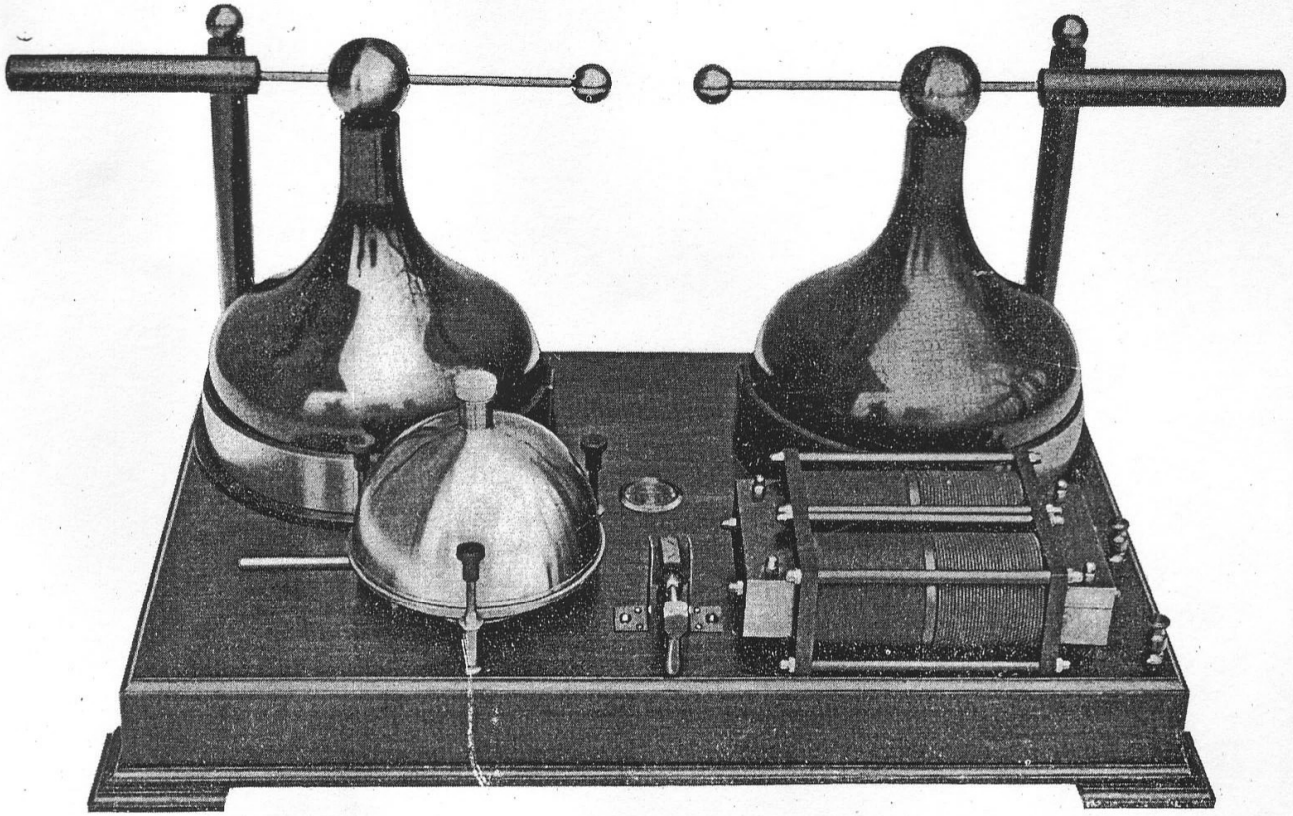
A most valuable feature is the water cooled spark gap. The heat ordinarily developed in various parts of other coils is localized here, where it can be taken care of without trouble or risk. In other coils there is a single discharge from every interruption of the primary circuit. With this spark gap we have a high frequency apparatus giving many hundred discharges, or surgings, in the secondary for every break or reversal in the primary.

DISCHARGE

This diminishes the time of exposure and increases the steadiness of the illumination of the screen. The appearance of the discharge is wholly different from the Rhumkorff spark, and must be seen to be appreciated.

IMPROVED INTERRUPTER

A vexatious feature of the old apparatus was the constant attention required by the vibrator. The sticking of the platinum points and the cost of their renewal



THE KINRAIDE HIGH FREQUENCY COIL, ALTERNATING CURRENT

is entirely eliminated by the new rotary break, which will easily handle sufficient current without noticeable sparking.

DURABILITY

This interrupter is a most solid and durable thing, and with the spark gap, embodies an entirely new principle. It is as durable as any part of the coil, and when started runs at constant speed until the motor is stopped. The alternating coil requires no interrupter. The spark gap, however, is essential.

PORTABILITY

LIGHT WEIGHT

The use of so little wire in the coil makes the apparatus compact, strong and readily portable. The whole outfit may be taken in the physician's buggy. In hospitals it may be placed upon a small table, and moved from ward to ward. The weight of the coil complete is from sixty-five to seventy-five pounds.

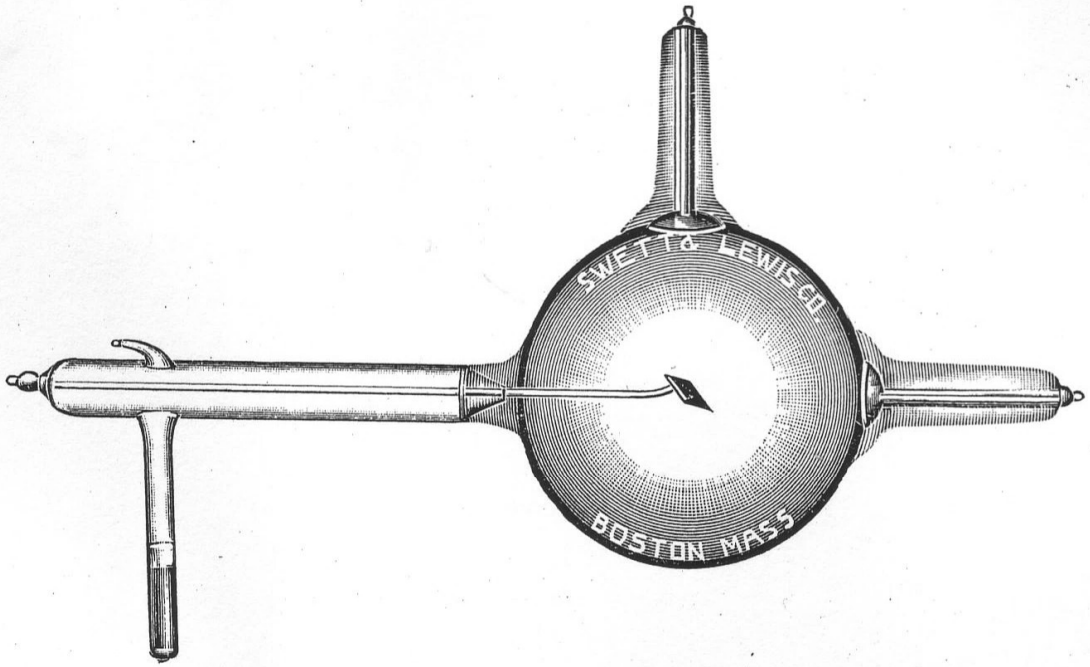
SMALL AMOUNT OF CURRENT USED

This apparatus consumes about two hundred watts, costing from two to four cents per hour at the average price of electricity. It may be attached to any incandescent lamp socket, either direct or alternating current.

SHORT EXPOSURES

SUCCESSFUL TESTS

For X-ray fluoroscopic work great steadiness of illumination is necessary; also energy enough to brilliantly illuminate the screen. For radiographs it is essential



TYPE H FOR ALTERNATING CURRENT USE

EXPOSURE

that the time of exposure should not be long; in fact, a great amount of detail in the finished negative is often sacrificed on account of difficulties attending a prolonged exposure. All these valuable effects are obtainable in this new apparatus, which has been put to most severe tests in both private and hospital work for the past three years, and is highly recommended by the users.

The following table of exposures will be found to meet the requirements in the average case, with a normal distance and a plate of the ordinary speed.

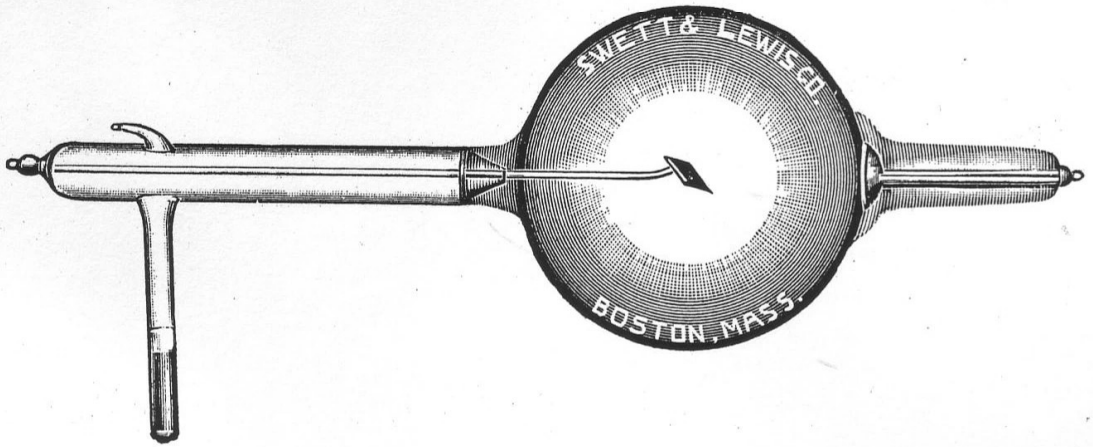
FOR ADULTS

Chest	2 minutes	Pelvis	2½ minutes
Shoulder	2 minutes	Hip	2½ minutes
Elbow	15 seconds	Knee	60 seconds
Wrist	5 seconds	Ankle	15 seconds
Hand	3 seconds	Foot	5 seconds

SUMMARY OF ADVANTAGES

RELIABILITY

A summary of the advantages of the Kinraide Coil are portability, safety of operation, simplicity of construction, durability, small amount of current used in operating, steadiness of illumination of fluorescent screen, a greater amount of X-ray light than from any other apparatus, always ready for work in all weathers, no sparking into the primary, no melting of the solid insulation of the secondary, easily and cheaply repaired, no platinum points, no breaking down of the condenser, a much shorter time of exposure than has been before obtained, and it cannot be burned out.



TYPE K FOR DIRECT CURRENT USE

REGULATION AND CONTROL

The Kinraide Coil and the tubes designed for it are built to stand the full current from the street mains. Experience, however, has shown that a regulating device is required for the best work.

SPECIAL RHEOSTAT

For this purpose a special rheostat is inserted in the primary circuit, and this, together with the vacuum regulating device attached to the tube and stand, enables the operator to regulate the coil and tube to a nicety.

In the field of therapeutics a rheostat is an absolute necessity, as the full current from the coil can be borne by but few patients. By its use the dosage may be regulated from one so light as to be almost imperceptible, to one so strong as to produce the most severe effects.

TUBES

Our tube, at first sight, is not different from the ordinary X-ray tube. It is, however, carefully constructed upon accurate measurements made from, and according to the requirements of this coil. The curvature and size of the cathode, its distance from the anode, and the proper vacuum have all been experimentally determined and incorporated into its structure. The alternating current tube is a new departure, is the outcome of years of experimentation, and is unequalled for definition. For best results our tubes should always be used with these coils.

VACUUM ADJUSTER

Too much stress cannot be laid upon the necessity of having a suitable tube, as therein lies the secret of the best work. All of our tubes for coil use are fitted with our special vacuum adjuster, by which the vacuum can be held at any point with ease. It has been a difficult problem to successfully design a tube to resist the energy developed by the Kinraide Coil, many methods having been tried with varying success.

HEATING CONTROLLED

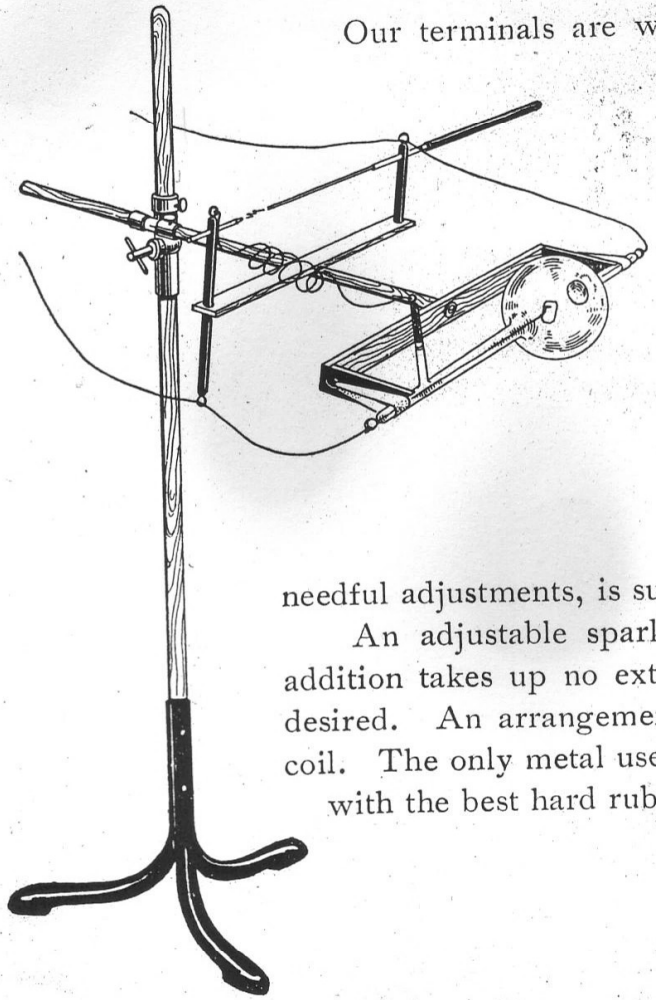
Cold water is not a desirable element to introduce into a tube while in operation; neither is the use of masses of base metal to take up the heat advisable, on account of the gases given off, which change the vacuum. We believe the proper method is to use extremely thick platinum, the avoidance of which has heretofore been the object of many manufacturers. We have found that this is the surest and best method to accomplish the end sought.

ANODES

The anodes on this type tube will become red or almost white hot if the entire current of the coil be used. This does no harm as the platinum is of the hardest variety known and is supported on a steel rod, which will not bend or become displaced.

ECONOMY

Our tubes are run successfully by the most powerful generators with no trouble from varying vacuum, and experience has proved their use is economical. They are readily repaired, an advantage not possessed by the complicated varieties, and by no means an unimportant consideration. All our tubes are *hand made* from the best German glass, and are carefully annealed and exhausted to just that nice point which gives the best results.

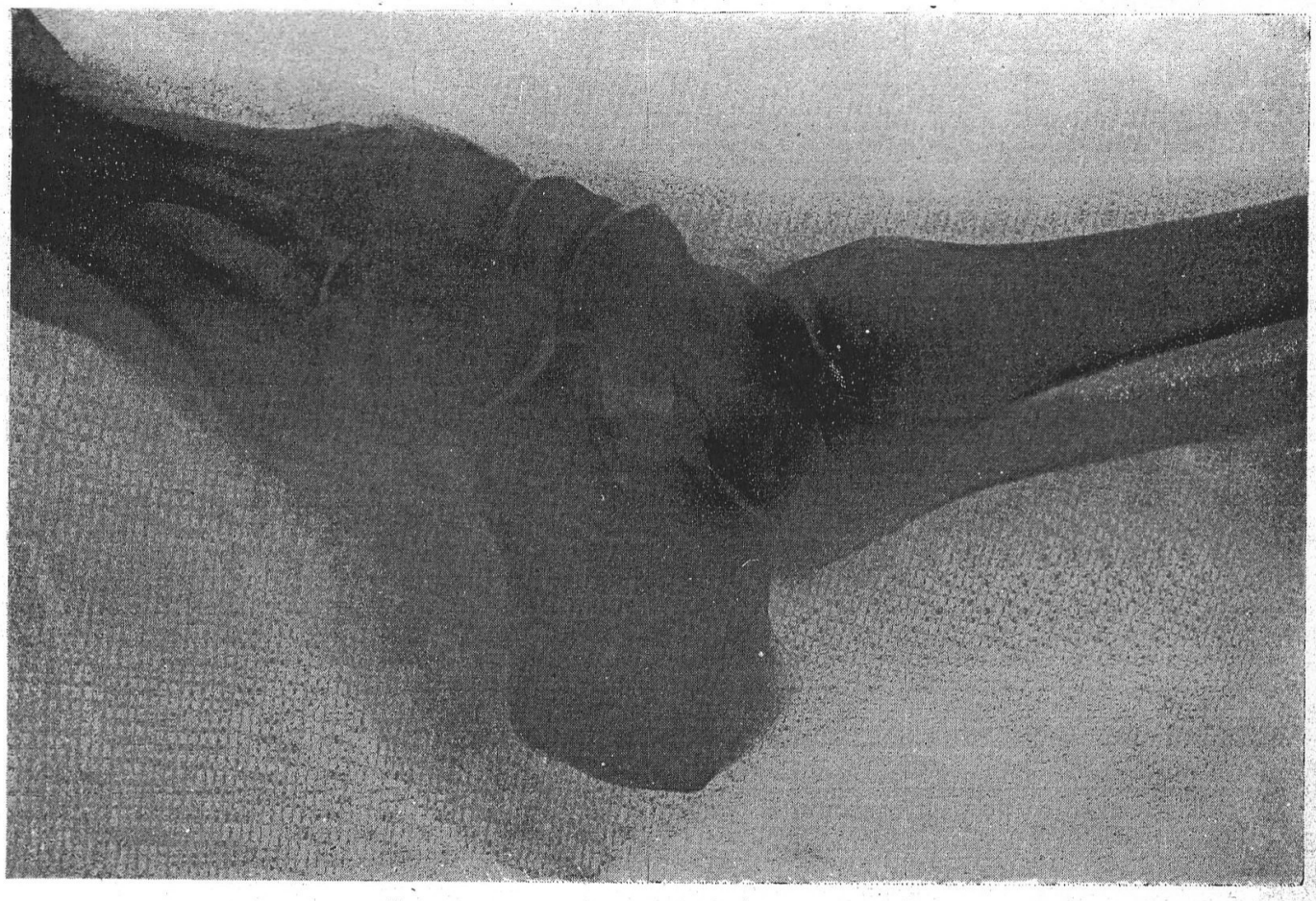


Our terminals are worthy of commendation. We are proud of the mechanical design of our tubes, and extended use shows that they have ample strength exactly where needed. In short, our aim has been to avoid complications of all kinds, and the accompanying cuts show how well we have succeeded.

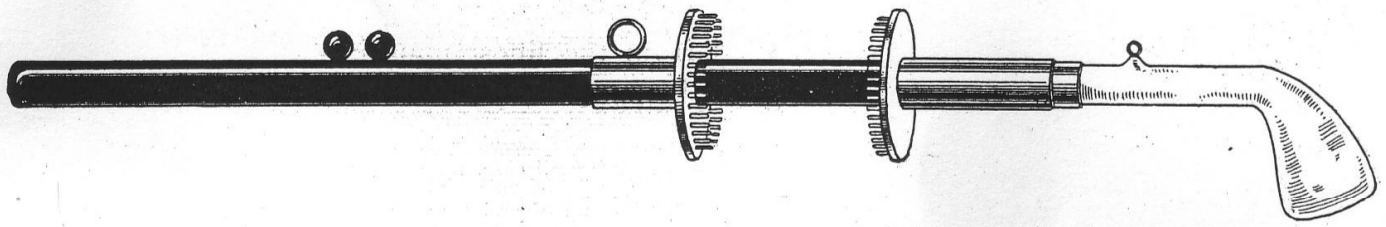
TUBE STANDS

Our experience has shown us that the present tube-holders on the market leave much to be desired for practical every-day work. After much experimenting we have produced a floor stand that is not complicated, has all needful adjustments, is sufficiently rigid, and looks well.

An adjustable spark gap for tube regulations is a valuable feature, and this addition takes up no extra space. By its use the vacuum may be held at any point desired. An arrangement of this sort is a necessity and should be ordered with each coil. The only metal used is the cast iron base. The tubes and wires are well insulated with the best hard rubber, thus increasing the efficiency of the whole apparatus.



FIFTEEN SECONDS EXPOSURE



CODE WORD, KRAENZLER

DR. STRONG'S REGULATING HANDLE

The above handle was devised by Dr. Frederick Strong, of this city, and used by him as a means of regulating the dosage delivered by the various forms of vacuum electrodes.

DISCHARGE

With the plates widely separated, there is little, if any, effect perceptible by the patient, but by bringing them nearer together a beautiful blue discharge takes place, and the amount of current is gradually increased.

The various forms of electrodes illustrated on pages 19 and 21, but without handles and with special base, may be used with this handle.

Price of Handle complete with one No. 14 Electrode, ...	$15.00
Extra Electrodes, each	4.00

PRICE LIST

This apparatus is constructed from the finest materials and finished in the best possible manner. No second grade is made.

COILS

The Kinraide Induction Coil (Direct and alternating currents of all voltages from 20 to 250)	$200.00
500-Volt Coils, extra	20.00

CODE WORDS

52 volts, 7,200 Alternations, Koperig	110 volts, Direct Current, Intardatum
110 volts, 7,200 Alternations, Koperkies	220 volts, Direct Current, Intardetis
52 volts, 16,000 Alternations, Koperkleur	235 volts, Direct Current, Intarlando
110 volts, 16,000 Alternations, Kopermolen	250 volts, Direct Current, Intarlare
110 volts, 15,000 Alternations, Kopermunt	500 volts, Direct Current, Intarlato

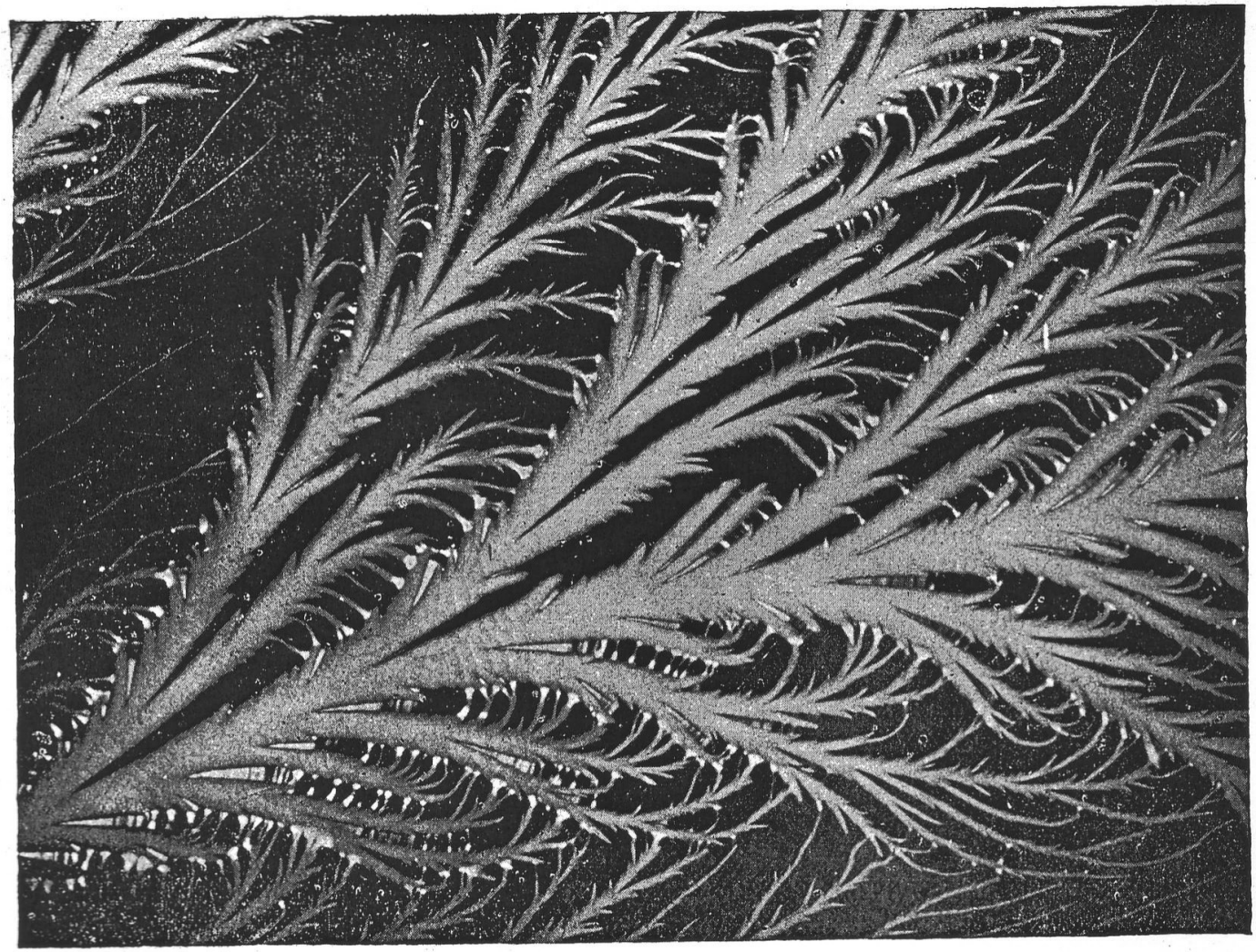
TUBES

K Tube for Direct Current Coil (Code Word, Delustro)	$15.00
H Tube for Alternating Current Coil only (Code Word, Delusively)	18.00
Insulating Cords for Connecting Tubes, per set	1.00

An allowance of $3.00 towards the price of new apparatus will be made for the return of the complete terminals of either of the above tubes.

FLUOROSCOPES

Platinum Barium Cyanide Fluoroscope, 4 x 5 (Code Word, Eapse)	$ 8.00
Platinum Barium Cyanide Fluoroscope, 5 x 5 (Code Word, Earinus)	10.00
Platinum Barium Cyanide Fluoroscope, 5 x 7 (Code Word, Earshrift)	12.50
Platinum Barium Cyanide Fluoroscope, 6 x 6 (Code Word, Earthiness)	13.00
Platinum Barium Cyanide Fluoroscope, 6 x 8 (Code Word, Earthling)	16.00
Platinum Barium Cyanide Fluoroscope, 8 x 10 (Code Word, Earthly)	24.00



POSITIVE DISCHARGE FROM KINRAIDE COIL (REDUCED)

QUALITY

The Platinum Barium Cyanide from which these screens are manufactured is crystalized and re-crystalized before the cardboard is coated; afterwards a protecting varnish is applied, which makes them, in our opinion, the best screens in the country today. These screens are brilliant and lasting, and of very fine grain.

Tungstate of calcium screens will be furnished if desired. These are much cheaper, but we do not recommend them for ordinary work. Price list on application.

X-RAY PLATES

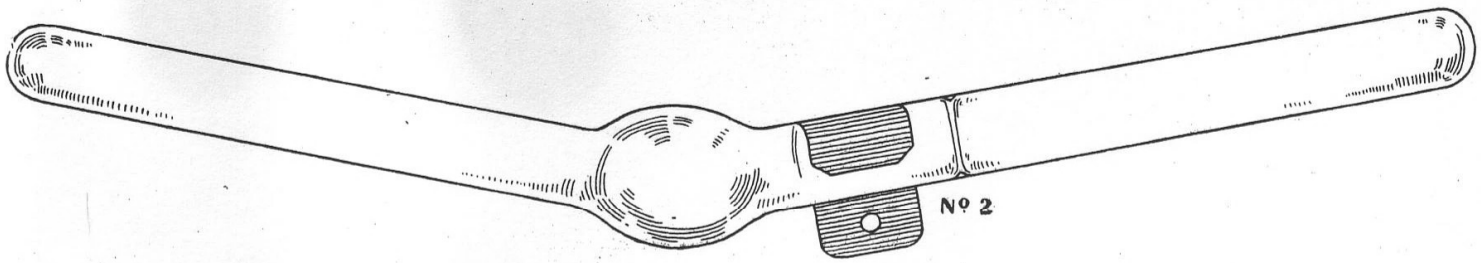
5 x 7, per dozen	$1.40
6½ x 8½, per dozen	2.30
8 x 10, per dozen	3.40
10 x 12, per dozen	5.50
11 x 14, per dozen	7.00
Complete developing and printing outfit, with full instructions for use	5.00

A supply of the above sizes always in stock. These plates are specially wrapped in light proof paper, no plate holder being required for use with the X-ray.

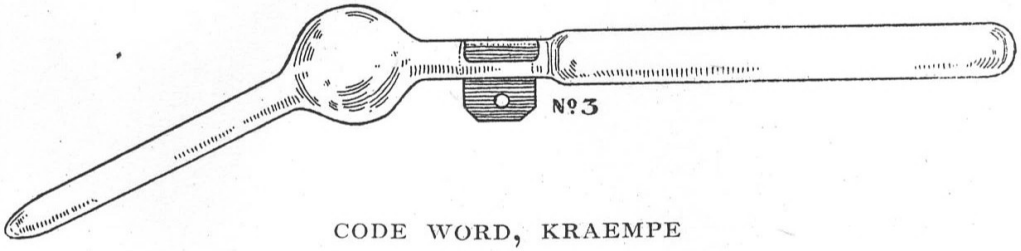
FLOOR TUBE STAND

Floor Tube-Stand, with Adjustable Spark Gap (Code word, Finados)	$10.00
A Finely Polished Quartered Oak Table large enough for either of the foregoing outfits, and equipped with ball bearing castors (Code word, Firmandos)	12.00
Rheostat	8.00

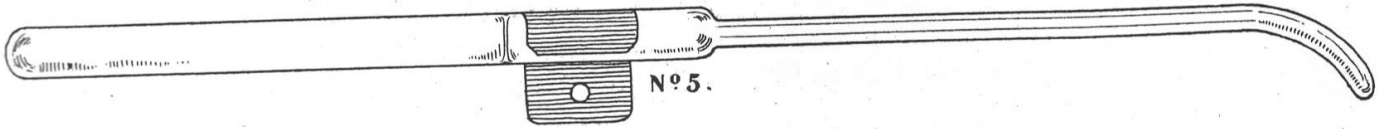
HIGH FREQUENCY ELECTRODES



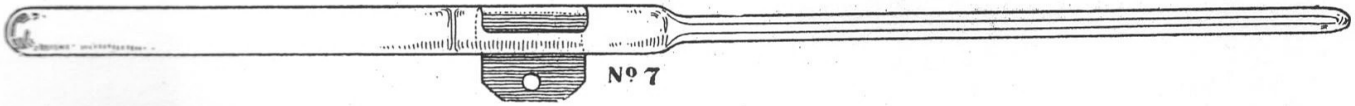
CODE WORD, KRAEMPELN



CODE WORD, KRAEMPE



CODE WORD, KRAENKER



CODE WORD, KRAENKLICH

ELECTRODES FOR HIGH FREQUENCY WORK

No. 14	Vacuum Electrode, for general application	$4.00
No. 2	Vacuum Electrode, for vaginal application	4.00
No. 3	Vacuum Electrode, for rectal application	4.00
No. 11	Vacuum Electrode, for vaginal application, with cuped end	4.00
No. 5	Vacuum Electrode, for urethral application, with curved end	4.00
No. 7	Vacuum Electrode, for urethral application, straight	4.00
No. 15	Vacuum Electrode, for eye application	4.00
Nos. 17 and 18	Two Geissler Vacuum Electrodes, highly colored for giving general tonic treatment	4.00
	One pair Metal Handles and Cords	1.00
	Special Electrodes for any purpose and of any shape made to order; price on application	
	Set of eight Electrodes, Metal Handles and Cords	25.00

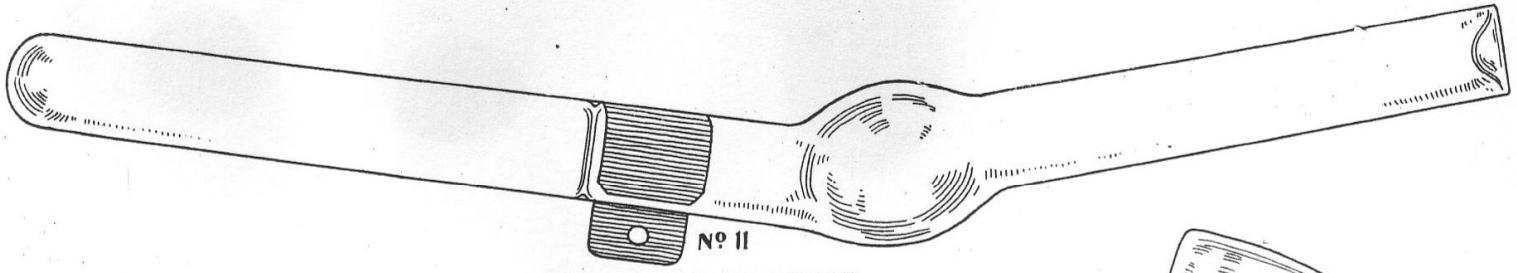
SAMPLE OUTFITS

OUTFIT NUMBER TWENTY-ONE (Code Word, Unproposed)

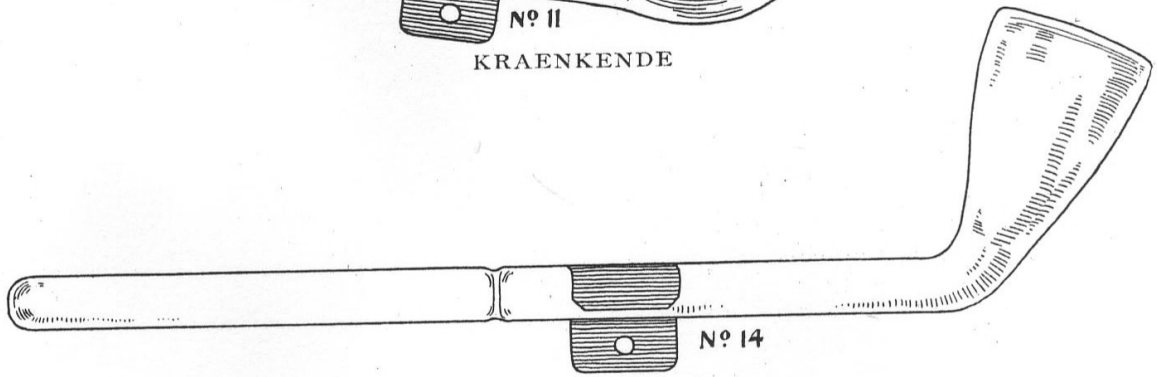
FOR DIRECT CURRENT—

One (1)	Direct Current Kinraide Coil	$200.00	
Two (2)	Tubes, Type K	30.00	
One (1)	5 x 7 Platinum Barium Cyanide Fluoroscope	12.50	
One (1)	Floor Tube Stand, with adjustable Spark Gap for controlling vacuum	10.00	$252.50

HIGH FREQUENCY ELECTRODES

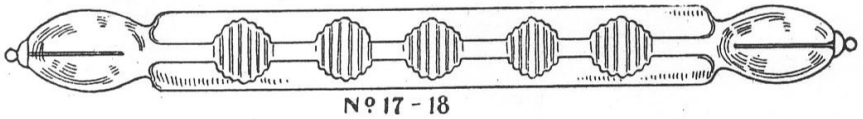


KRAENKENDE



KRAEMERIN

No. 15. CODE WORD, KRAENKUNG



CODE WORD, KRAENZCHEN

CODE WORD FOR SET, KRAENZEN

OUTFIT NUMBER TWENTY-TWO (Code Word, Vestiaires)

FOR ALTERNATING CURRENT—

One (1) Alternating Current Kinraide Coil	$200.00	
Two (2) Tubes, Type H	36.00	
One (1) 5 x 7 Platinum Barium Cyanide Fluoroscope	12.50	
One (1) Floor Tube Stand, with adjustable Spark Gap for controlling vacuum	10.00	$258.50

A rheostat for regulation is recommended for use with either of the above outfits.

OUTFIT NUMBER TWENTY-THREE (Code Word, Unprovide)

FOR DIRECT CURRENT—

One (1) Direct Current Kinraide Coil	$200.00	
Two (2) Tubes, Type K	30.00	
One (1) 6 x 8 Platinum Barium Cyanide Fluoroscope	16.00	
One (1) Floor Tube Stand	10.00	
One (1) Rheostat	8.00	
One (1) Quartered Oak Table	12.00	
One (1) Set of Three Electrodes, Nos. 14, 17 and 18	8.00	$284.00

OUTFIT NUMBER TWENTY-FOUR (Code Word, Vestiairo)

FOR ALTERNATING CURRENT—

One (1) Alternating Current Kinraide Coil	$200.00	
Two (2) Tubes, Type H	36.00	
One (1) 6 x 8 Platinum Barium Cyanide Fluoroscope	16.00	
One (1) Floor Tube Stand	10.00	
One (1) Rheostat	8.00	
One (1) Quartered Oak Table	12.00	
One (1) Set of Three Electrodes, Nos. 14, 17 and 18	8.00	$290.00

In ordering coils give *voltage of circuit, whether direct or alternating; if alternating, the number of alternations.*

Full directions for operating accompany each coil.

We want our customers to feel perfectly free at all times to call upon us for expert advice on all things pertaining to the operation of X-ray outfits.

The factory where our goods are manufactured is well equipped with the finest tools and latest facilities for our business.

CATALOGUES — If interested in static machines and electro-therapeutical apparatus in general send for Bulletin Number Twenty-Four. Static tubes, Bulletin Number Twenty-Five.

SUPERIORITY — In therapeutics it is generally conceded that the Kinraide Coil is superior to all other apparatus in as much as the current may be used to excite the various high frequency electrodes for both internal and external uses. Pictures of a few of the various forms of electrodes will be found on preceding pages.

THERAPEUTICS — For treating cancer, lupus, the various forms of skin diseases and the removal of superfluous hair, the coil and X-ray tube have a very broad field. The numerous forms of regulation, the reliability and the great quantity of X-rays generated, make the apparatus a most necessary part of a well-equipped office.

Coils in general and the Kinraide Coil in particular are conceded by those best posted in this sort of work to excel all other instruments.

SWETT AND LEWIS COMPANY

TERMS

Prices in this catalogue are net.

Remit by money order, express or by New York draft. Add twenty-five cents to face of all checks, except on New York or Boston, to cover collection charges.

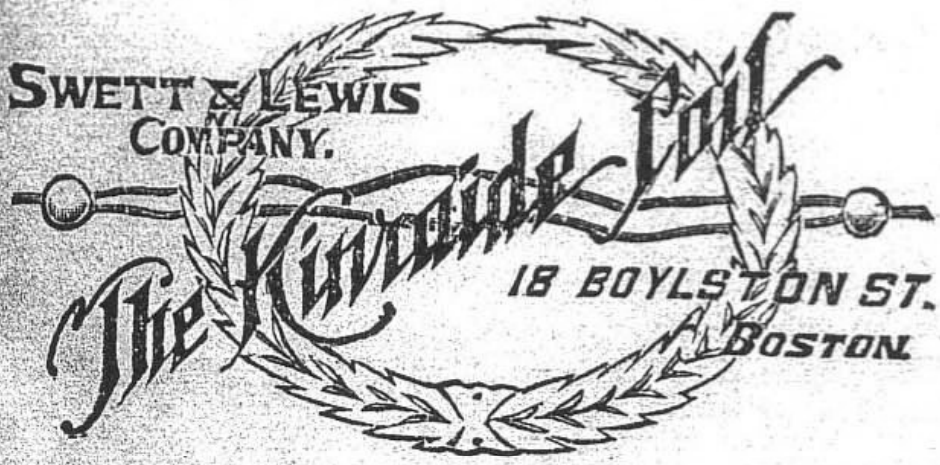
REFERENCES

Customers unknown to us must give satisfactory references, or send draft with order, for which we will allow five per cent. discount. We will ship C. O. D., provided a remittance of twenty per cent. accompanies order. Charges for return of money to be borne by purchaser.

Goods will be delivered f. o. b., freight or express, Boston, Mass. No charge for packing. Each piece of apparatus is carefully packed and no allowance will be made for loss or breakage in transit.

Western Union Telegraph code used. Telegraph and cable address, "Swettxray."

BLOCK TIN For X-Ray Therapy. Per pound, 75 Cents



This material is specially rolled for us and is of the proper thickness for use in treating cancer, lupus and all diseases where the X-Ray is used. It is much lighter than lead, is as flexible, and remains clear and bright.

we recommend a storage battery and primary cells, or, if the alternating current from the street mains is available, a transformer may be used.

Price, complete set, including two cells, storage battery, set of primary battery, and cautery set, described on page 23 . . . . . $44.00

Transformer, for use on 104 or 52 volt, alternating current 20.00

ELECTRIC HAND LAMP.

For the physician and others, a pocket electric searchlight. Handy in every case where a powerful light of short duration is needed. This lamp is operated by three cells of dry battery, and will last a long time. When the cells become exhausted a new charge should be inserted.

Price, $3.00. Charges, 30 Cents.
By Mail, $3.30. By Mail, 50 Cents.
Larger size, batteries guaranteed for ten hours' use, $3.50.
By Mail, $4.00.

BOOKS.

Monell's Manual of Static Electricity in X-Ray and Therapeutical Uses $6.00

Morton on the X-Ray. Paper, 50 cents; cloth 75

Meadowcraft. A B C of the X-Ray. Cloth 75

Atkinson's Static Electricity 1.50

Removal of Superfluous Hair and Other Blemishes by Electricity 1.00

Haynes' Elementary Principles of Electro-Therapeutics . 1.50

The Barta Press, Boston.

Bulletin No. 24.

Static Machines, X-Ray Supplies, AND Electro-Therapeutical Apparatus.

Manufactured by

SWETT & LEWIS CO.,

79 Franklin Street, Formerly 11 Bromfield Street,

BOSTON, MASS.

GREETING.

We wish to thank our customers for their cordial support of the last three years. On our part we have striven to warrant this patronage by improving our apparatus every way in our power.

In March last, we purchased the business and good-will of the American Roentgen Ray Co., and in our new machines we will incorporate the best features of their machines together with the tried and proven parts of our own, making our modern outfit the culmination of years of practice and experiment.

The manufacturing department of our business has been placed in the hands of Mr. Howard Jackson, a well-known electrical engineer, and all goods are made under the direct personal supervision of our manager, Frank H. Swett, M. E.

We have added to our line of static and X-ray apparatus a full line of galvanic and faradic batteries, light sets, and everything in electro-medical equipment and supplies.

SWETT & LEWIS CO.,

Successors to

G. A. FREI & CO., and AMERICAN ROENTGEN RAY CO.

July 7 1901

TO PURCHASERS.

Terms cash.

The prices in this catalogue are *net*, subject to change without notice.

Five (5) per cent. discount will be allowed when cash accompanies the order. Goods will be sent C. O. D. when at least 20 per cent. of the entire amount of invoice accompanies order. Return charges are at expense of purchaser.

Remittances should be made by New York bank draft, express or postal order.

Goods will be delivered F. O. B., freight or express, Boston, Mass.

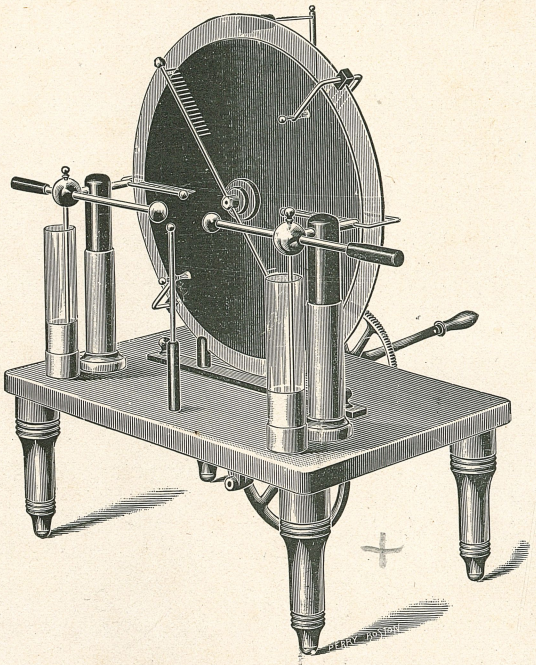
No charge is made for packing.

Each piece of apparatus is carefully packed, and no allowance will be made for breakage in transit.

Immediate shipment guaranteed.

STATIC MACHINES.

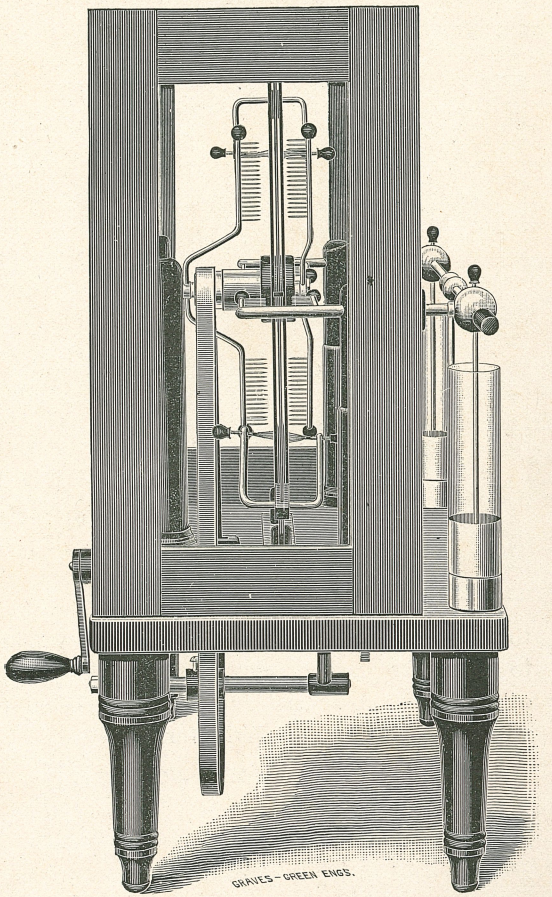
The cabinet work on our machines may be either mahogany or oak, and is designed for strength and neatness Every machine, unless especially ordered to the contrary, is provided with a case of wood and glass which insulates the generating parts from the outside atmosphere. Access to the working parts is obtained through doors in each end of the case. To prevent electrical leakage all the metal and conducting parts are firmly fixed on hard rubber supports. The driving gear is so arranged that the operator may easily run the machine at its required speed of from 1,500 to 2,000 revolutions per minute. If desired, a special pulley for a motor will be attached without extra charge. The bearings are self-adjusting and self-lubricating and require no attention. For convenience of manipulation the discharge rods are placed on the outside of the case.



Our No. 1 machine has one stationary glass plate and one revolving rubber plate, will give a 4 or 5 inch spark, and is built for

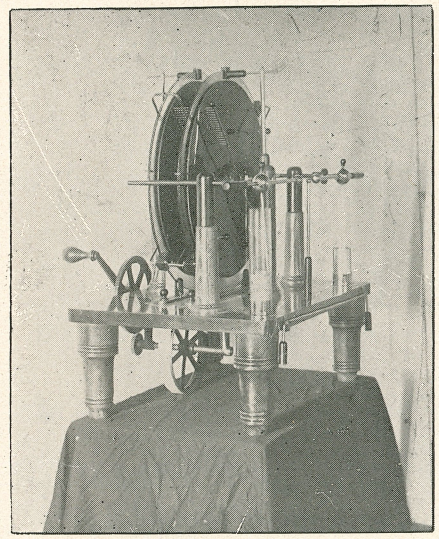
school and experimental work. It will show the bones of the hand or arm with the fluoroscope.

The No. 2 machine is especially adapted to the needs of the physician in general practice for X-ray and therapeutical work. It has two stationary glass plates and two revolving rubber plates, and will give an 8 inch continuous spark. It is useful in light therapeutical and the smaller X-ray work.



No. 2 Special is of the same capacity as the preceding, but is built more substantially, and is adapted to long continuous service of the hardest nature. In essentials, it is the same as No. 2, with the addition of an extra support for bearings, giving greater rigidity, special brushes, clips for Leyden jars and short-circuiting rods.

Our No. 3 machine has four stationary glass and four revolving rubber plates, will give an 8 inch spark of twice the volume of the No. 2, and is built for physicians and hospitals desiring a neat, compact, and powerful X-ray and therapeutical outfit. This machine has been growing in favor with the medical profession during the past year, as is attested by the numerous unsolicited testimonials which we have received. It may be run by hand, or, if preferred, from any source of power.



At present we are building a new line of static machines which will shortly be placed upon the market. They will embody all the latest improvements, including pole-changer, *air-tight* case, anti-friction, self-adjusting, oilless bearings, and belt-tightening device, all so arranged that in the operation of the machine it will never be necessary to open the case or expose the working parts to the outside atmosphere. A special supplement devoted to these machines will be issued shortly. Write for it.

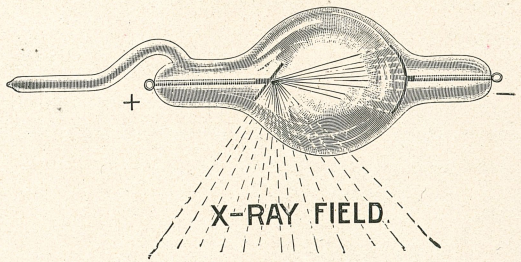
NET PRICE LIST.

No. 1	$30.00
„ 2	45.00
„ 2 Special	60.00
„ 3	95.00
„ 3 (with pole-changer)	100.00

For prices of complete outfits see page 11.

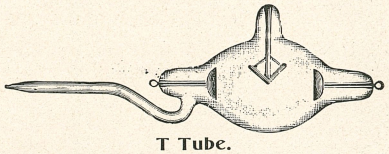
TUBES.

We feel justly proud of the way our tubes have stood the hard and exacting tests to which they have been submitted in the past few years.



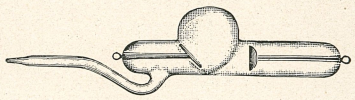
S Tube.

Too much care cannot be exercised in fitting a tube to a special machine. We make tubes for all kinds and sizes of generators and carry in stock all the ordinary styles. In placing an order for a tube, it is absolutely necessary to specify the kind of machine and the spark length upon which it is to be run in order that you may receive a tube of the correct style and vacuum.



T Tube.

If you have any special idea that you wish embodied in a tube, send us the specifications and we will make it for you.



B Tube.

PRICE LIST.

Type S, for small static machines	$ 5.00
„ W, „ medium „ „	6.75
„ M, „ largest „ „	8.00
„ R, „ large coils	7.50
„ B, „ coils 6 ins. or less	5.00
„ T, „ Tesla coils	7.50
„ T, „ large size, adjustable vacuum	10.00

Type W may also be used for coils.

Vacuum regulator, $2.00 extra. Repumping: S and B, $1.00; W and T, $1.50; M and R, $2.00. Repairing at reasonable prices.

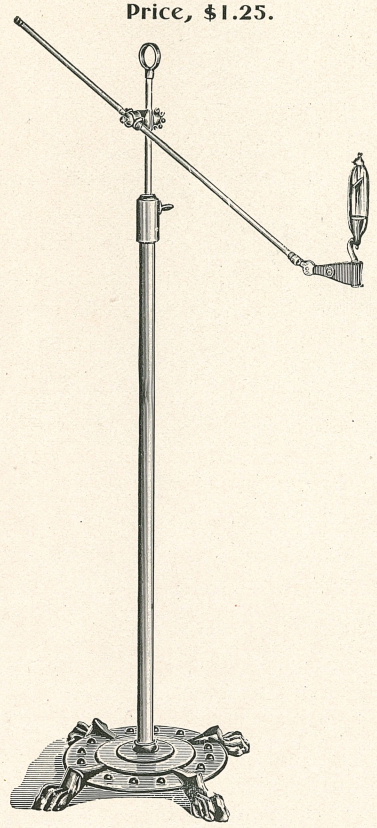
We make a specialty of repairing and repumping other makes of tubes. We will not hold ourselves responsible for the breaking

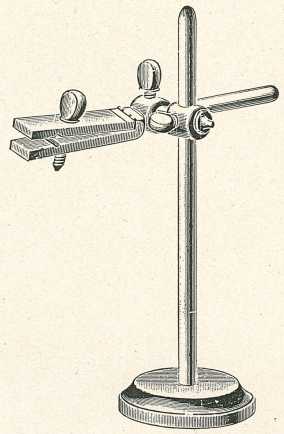
of tubes undergoing repairs. Our new special static tube is superior in definition, brilliancy, and life. Prices same as for regular S and W. When ordering, specify *Special S* or *Special W*.

TUBE STANDS.

Our small tube stands are made of highly polished maple, cork jaws, triple swing, giving any possible angle, and are weighted with lead to hold the tube steady.

Price, $1.25.



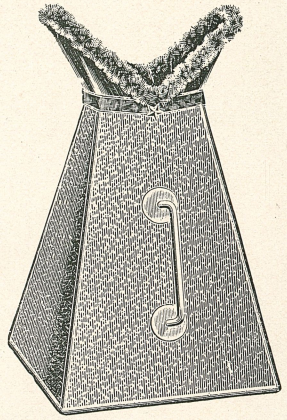


Our floor stand is particularly adapted for use in hospitals, or places where a large range of position for the tube is necessary. This stand is made of iron with a fiber arm, cork jaws for the tube, insulators for holding wires at least 16 inches apart, and will hold the tube in any position from 1 to 9 feet from the floor.

Price, $10.00.

FLUOROSCOPES.

There are two different kinds of fluoroscopes, the tungstate of calcium and the platinum barium cyanide. The advantages of the tungstate are its long life and comparatively low price. Our tungstate screens are made from the best crystals obtainable, in a thorough and workmanlike manner, and are unsurpassed.



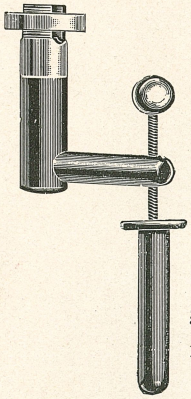
Our barium screens are manufactured by a new process, which insures a much longer life for them than heretofore, and are a triumph of brilliancy, definition, and wearing quality. The barium screen is fully 75 per cent. clearer than the tungstate, and the increased cost will be money well spent to any one who uses the X-ray any appreciable amount.

PRICE LIST.

Calcium Tungstate.		Platinum Barium Cyanide.	
4 x 5	$5.00	4 x 5	$8.00
5 x 5	6.00	5 x 5	10.00
5 x 7	9.00	5 x 7	12.50
6 x 6	9.00	6 x 6	13.00
6 x 8	11.00	6 x 8	16.00
8 x 10	16.00	8 x 10	24.00

Unmounted tungstate calcium screens, 15 cents per square inch.

SPARK GAPS.



It is an established fact that for X-ray work a double spark gap, *i. e.*, a gap at each pole, is very much better than the old method of a single gap. To make this feasible, we manufacture these spark gaps.

They are made of brass and rubber, so arranged that they may be clamped to the discharge rods, and the length of gap regulated by a screw. These, or the pole-changer with double gap listed below, should be used on all static machines intended for X-ray work.

Price, $3.00 per pair.

POLE-CHANGER.

By request of a number of our friends, we have designed a combined *pole-changer and double spark gap*. This may be attached to any static machine in five minutes' time with only the aid of a screwdriver.

By its use the tube may be instantly reversed without disturbing the spark-gap adjustment or connections. This appliance is neat in appearance, simple, and positive in action. In ordering state size, style, and finish of the machine it is to be used on.

Price, $8.00.

Pole-changers for machines of other makes made to order. Price on application.

SAMPLE OUTFITS.

Outfit A.

One No. 2 machine, including case	$45.00
„ tube, type S	5.00
„ extra tube, type S	5.00
„ tube stand	1.25
„ tungstate of calcium fluoroscope, 6 x 6	9.00
	$65.25

Outfit E.

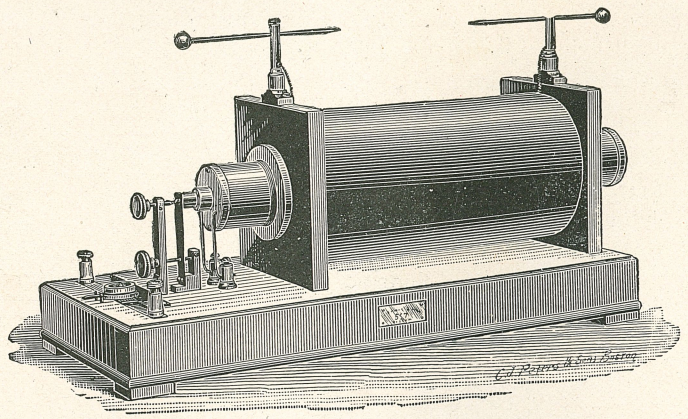
For experimental and school work.

One No. 1 machine	$30.00
„ tube, type S	5.00
„ tube stand	1.25
„ fluoroscope, 5 x 5	6.00
	$42.25

Outfit G.

One No. 3 machine, including case and pole-changer	$100.00
„ tube, type S, with adjustable vacuum	7.00
„ „ „ S	5.00
„ „ stand	1.25
„ tungstate of calcium fluoroscope, 6 x 8	11.00
	$124.25

We recommend the addition of a pole-changer or a pair of spark gaps to each of the above outfits. Price: pole-changer, $8.00; spark gaps $3.00.



Outfit D.

We would advise this outfit where from lack of room or other local reasons a static machine could not be used.

One 8 in. Ruhmkorff coil	$115.00
„ tube, type W	6 75
„ „ „ R	7.50
„ „ stand	1.25
„ fluoroscope, 6 x 8	11.00
Four cells storage battery, 100 ampere-hours	50.00
	$191.50

Prices on other sizes of coils and special catalogue on application. These coils are made expressly for us by one of the oldest coil makers in the country, and we do not hesitate to warrant them the best thing obtainable in the coil line.

Platinum fluoroscopes may be substituted for tungstate in any of the above outfits for difference in price. See page 9 for prices.

EXTRA PARTS.

Glass plates, each	$2.00
Rubber plates, each (subject to change with market price of rubber)	3.50
Leyden jars, each	.35
Wooden covers for Leyden jars, per pair	.50
Brass rod used to short-circuit machine so that connection to the tube may be changed while the machine is generating	1.00
Fused chloride of calcium, per lb.	.40
„ „ „ „ 10 lb. can	1.50
Pulley for attaching motor	1.00
Special stretched rawhide belts, each	.50
Belt needle, with waxed ends	.10
Brushes, each	.15
Cords with special hook tips for connecting tubes to machine, 5 foot, 50 cents; 10 foot	.75

When ordering parts, give serial number, which you will find on base of machine, behind gear wheel, and also on door of machine.

We make a specialty of furnishing parts of static machines and apparatus to experimenters or others who wish to build for themselves. Prices on application.

MOTORS.

Having so many inquiries for motors to run our machines, we list below the different styles and sizes in common use.

1/6 horse-power motor, 110 volt direct current for No. 2 machine	$25.00
1/6 horse-power motor, 104 or 52 volt alternating for No. 2 machine	60.00
1/4 horse-power motor, 110 volt direct for No. 3 machine	55.00
1/4 horse-power motor, 104 or 52 volt alternating for No. 3 machine	90.00
1/4 horse-power 500 volt direct current for No. 3 machine	60.00
Water motor for No. 2 machine, pressure of 80 lbs. to square inch, or over	15.00
Water motor for No. 2 machine, pressure under 80 lbs. to square inch	22.50
Water motor for No. 3 machine, pressure of 80 lbs. or over per square inch	22.50

In ordering motors, if electric, state voltage of the current, and if alternating, the frequency of alternations; if water motors, the water pressure per square inch and size of your supply pipe.

CARBUTT PLATES FOR X-RAY WORK.

These plates are individually wrapped in light-proof wrappers so that they may be used under the X-rays without any further preparation.

Size.	Per Dozen.	Size.	Per Dozen.
5 x 7	$1.30	11 x 14	$ 6.00
6½ x 8½	2.00	14 x 17	11.65
8 x 10	2 90		
10 x 12	4.50		

DEVELOPING AND PRINTING OUTFIT.

Two 8 x 10 developing trays	$2.20
One 8 x 10 printing frame	.75
„ 3 oz. bottle rodinal	.60
„ red lantern	1.00
„ pound hypo.	.10
	$4.65

Complete outfit with full instructions for use shipped immediately on receipt of order.

FLUOROMETER.

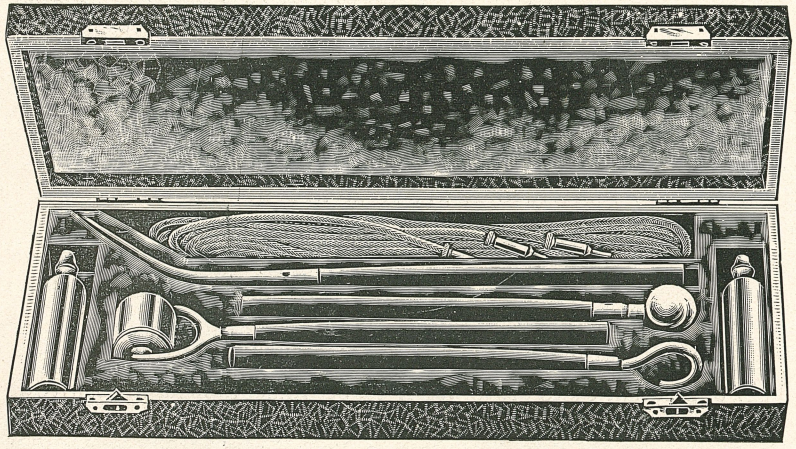
For use in hospitals, or in other places, where a very large number of accident cases are brought to be radiographed, a positive means of locating foreign substances is a great help both as to time and results. Such an apparatus is the Dennis fluorometer. Fuller details and special catalogue of this valuable adjunct to X-ray work on application.

Price, $150.00.

STATIC ELECTRODES.

Crown	$2.50
Point	1.00
Insulating handle	.50
Ball	1.00
Roller	1.50

Morton interrupting handle	$5.00
Insulating stool	6.00
Floor stand, with ball, crown, and point, complete	10.00
Static cords, per pair	.60



The above case contains one pair static cords with handles, one point, one roller, one insulating hook, and one ball, in plush-lined leather case.

Price, $6.50.

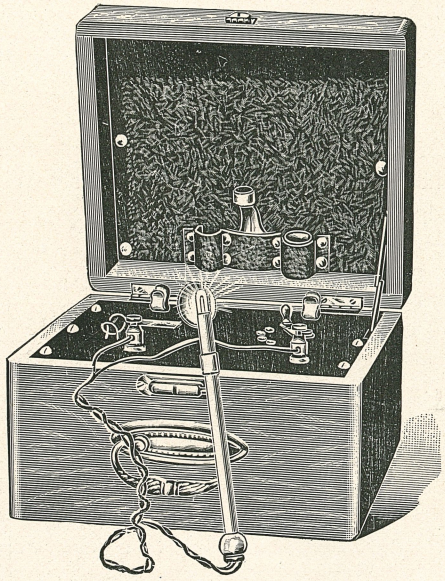
OZONE INHALER.

The therapeutic value of ozone is coming to be more and more generally recognized by the medical fraternity. To meet this want we make a neat appliance which may be used on any static machine. It consists of a glass bulb, with the proper terminals enclosed, firmly arranged on a polished turned wooden base.

Price, $6.00.

PORTABLE LIGHT SET.

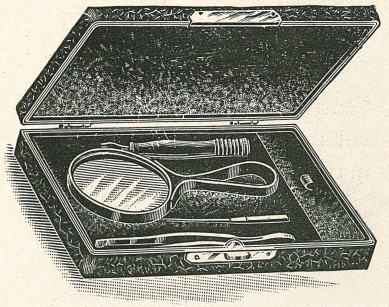
Recognizing the value to the physician of some little instrument for illuminating the interior parts, we have designed and built a neat and portable light set. The lamp used is of two candle power. Three silver-plated reflectors are furnished. The electricity is generated by three dry cells and the current is controlled by a simple rheostat. The case is finished in mahogany, all metal parts nickel plated and fitted with a neat drop handle and catch.



Price complete, $15.00.

EPILATION SET.

Having had many calls for a serviceable outfit that will permanently remove superfluous hair, we have designed and placed on the market a neat, compact, and thoroughly reliable set for that purpose. Eight cells of dry battery put up in a highly polished quartered oak case, with switch, rheostat, binding posts, cords, and sponges. We use the latest improved dry



cells with this outfit as well as the preceding, because they combine the advantages of portability, freedom from odor, and cleanliness, together with large output. The epilation case contains six steel needles, two iridio-platinum needles, needle holder, magnifying glass, and forceps. The lamp and reflectors used in the light set, also a small cautery knife, may be used with this battery. With the addition of the proper needles, this set may be used for the removal of naevi, birth marks, etc. Ample provision is made in the box for carrying these accessories. Wet battery may be substituted without additional cost.

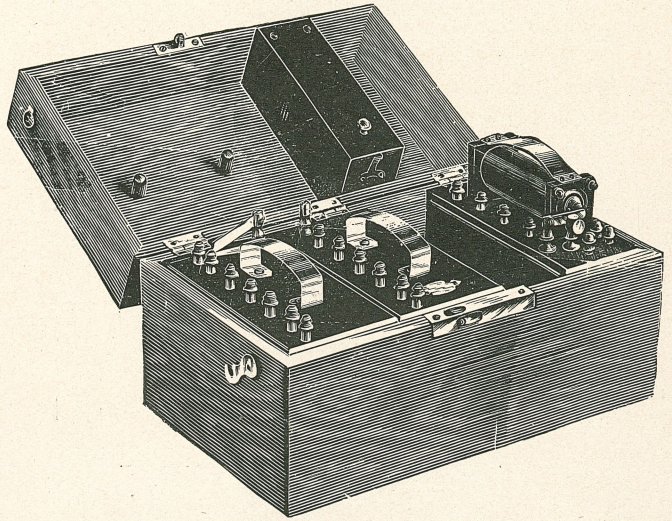
PRICE LIST.

Box, switchboard, battery, etc.	$15.00
Epilation case	3.25
Epilation set (complete)	18.00
Needle case (naevi, birth marks, etc.)	3.50
Small lamp with handle and reflector cord and socket	3.75
Cautery knives, each	.75
Lamp only	.80
Replacing battery cells	2.40
Cords (per pair)	.50
Sponges (per pair)	.75
Handles (per pair)	.60
Complete outfit (box, epilation case, needle case, lamp, cautery knife, cords, and sponges)	25.00

The cells used in this battery should last from six months to a year, according to use. When it is necessary to renew them, the cells can be procured and connected by the purchaser, or the box may be sent to us, express prepaid, and we will attend to it.

Prompt attention given to any special design of battery. Price quoted on receipt of specifications.

WET CELL GALVANIC AND FARADIC BATTERIES.



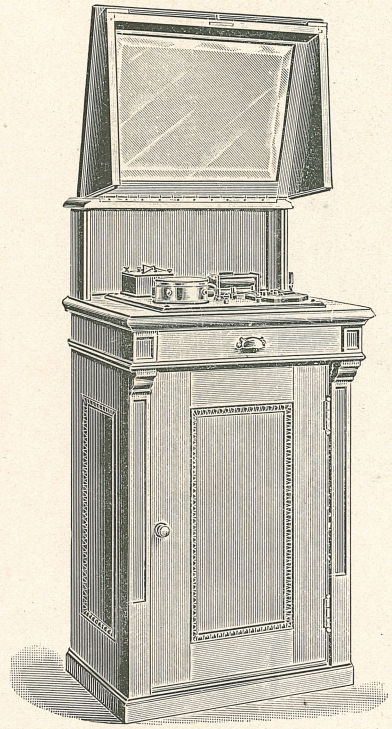
6 cell galvanic	$12.00
12 cell galvanic	18.00
12 cell galvanic and faradic	24.00
18 cell galvanic	24.00
18 cell galvanic and faradic	30.00
Battery solution, per pint	.25
Bichromate of potash, per pound	.25

Repairing on all makes and sizes of galvanic or faradic goods on short notice and at reasonable prices.

GALVANIC AND FARADIC CABINETS.

NO. 1 CABINET.

This cabinet has room for 42 cells of sal-ammoniac battery, a switchboard containing cell selector, wire rheostat, adjustable rheotome for both galvanic and faradic currents, faradic coil with adjustable vibrator, pole-changer, milliamperemeter, binding posts, and necessary switches, together with drawers for electrodes.



Price, without cells, $80.00.

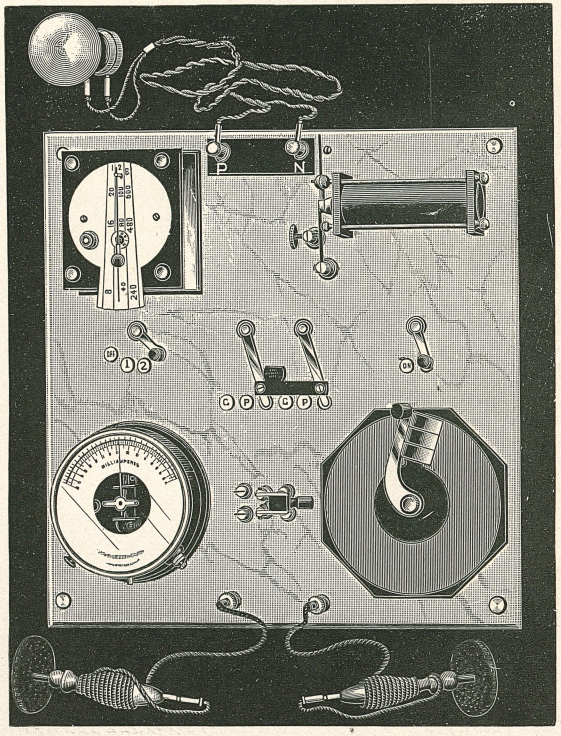
NO. 6 CABINET.

Illustrated.

The No. 6 cabinet is arranged for either the 110 volt direct current taken from the street main, or for 40 cells of primary battery. The marble plate has on it a milliamperemeter, graphite rheostat, faradic coil, adjustable rheotome for either galvanic or faradic currents, pole-changer, and the necessary switches and binding posts.

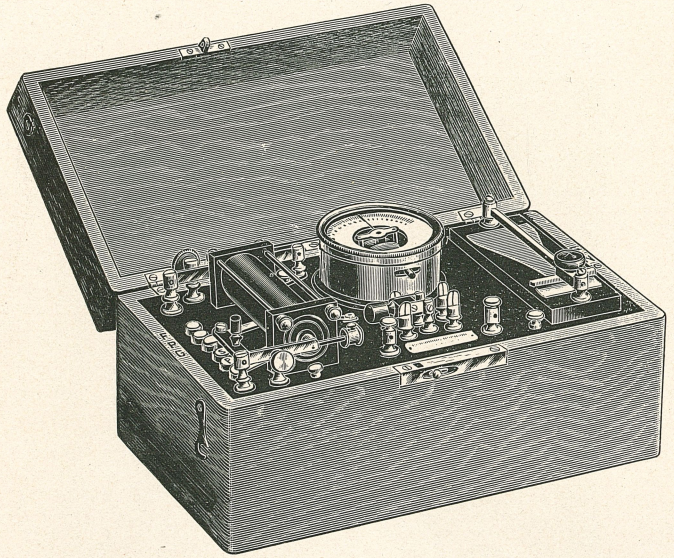
Price, without cells, $93.00.

With 43 special Swett & Lewis cells, $110.00.



No. 6 plate wired for 110 volt circuit.

Price, $60.00.



In some cases a portable galvanic battery is a valuable adjunct to the physician's equipment. This 40 cell (dry) galvanic and faradic outfit is 14½ inches long, 8¼ inches wide, and 7½ inches high, weighs 24 pounds, and is fitted with a special faradic coil having two vibrators, giving the fullest possible range of faradism, milliamperemeter, and graphite rheostat.

Price, including cords, handles, and sponges, $50.00.

Renewing cells, $3.00.

Prices and description of other styles and sizes of cabinets on application.

GALVANIC AND FARADIC PARTS AND SUPPLIES.

We list below a few of the galvanic and faradic accessories which we carry in stock:

Milliamperemeter	$15.00
Milliamperemeter (galvanometer form)	10.00
Graphite rheostat	7.50
Graduated automatic rheotome (for either galvanic or faradic)	12.00
Cautery set and knives (including handles and ecraseur loop)	12.00
General electrode case	9.00
Head lamp, aluminum parabolic reflector, with cords	9.00
Cords (per pair)	.75
Faradic batteries	$5.00, $7.50, $9.00, $18.00

We can furnish at a few days' notice any style of electrode manufactured and at market prices.

CELLS.

The best dry cells made at 40 cents apiece; lots of six or over, 35 cents apiece. The Swett & Lewis wet cell (for all open circuit work where long life and reliability are desired), 45 cents apiece; lots of six or over, 40 cents apiece.

Special wet cell (large zinc surface for use where large amperage is imperative), $1.25 each; lots of six or over, $1.10; lot of 40 or more, $1.00 each.

For all portable batteries of any kind we would recommend the use of dry cells, as their light weight and freedom from leakage and odor make them superior for transportation. For office work the Swett & Lewis sal-ammoniac cell is more efficient. Special description of these cells on application. For large cautery work

we recommend a storage battery and primary cells, or, if the alternating current from the street mains is available, a transformer may be used.

Price, complete set, including two cells, storage battery, set of primary battery, and cautery set, described on page 23 . . . . . $44.00

Transformer, for use on 104 or 52 volt, alternating current 20.00

ELECTRIC HAND LAMP.

For the physician and others, a pocket electric searchlight. Handy in every case where a powerful light of short duration is needed. This lamp is operated by three cells of dry battery, and will last a long time. When the cells become exhausted a new charge should be inserted.

Price, $3.00. Charges, 30 Cents.
By Mail, $3.30. By Mail, 50 Cents.
Larger size, batteries guaranteed for ten hours' use, $3.50.
By Mail, $4.00.

BOOKS.

Monell's Manual of Static Electricity in X-Ray and Therapeutical Uses $6.00

Morton on the X-Ray. Paper, 50 cents; cloth 75

Meadowcraft. A B C of the X-Ray. Cloth 75

Atkinson's Static Electricity 1.50

Removal of Superfluous Hair and Other Blemishes by Electricity 1.00

Haynes' Elementary Principles of Electro-Therapeutics . 1.50

The Barta Press, Boston.

Bulletin No. 24.

Static Machines, X-Ray Supplies, AND Electro-Therapeutical Apparatus.

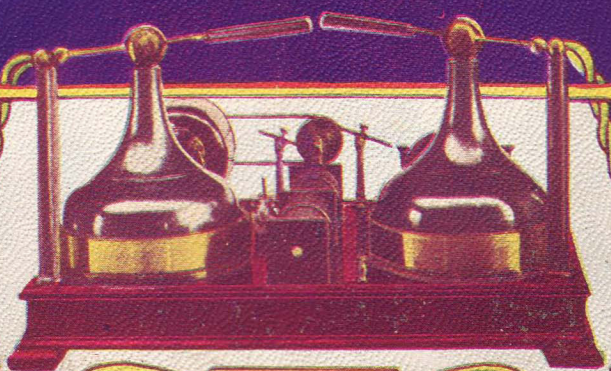
Manufactured by

SWETT & LEWIS CO.,

79 Franklin Street, Formerly 11 Bromfield Street,

BOSTON, MASS.

COILS
AND
X-RAY TUBES
SWETT & LEWIS COMPANY
BOSTON MASSACHUSETTS



Coils and Tubes

Bulletin Number
Thirty-three

MANUFACTURED BY
Swett & Lewis Company
Eighteen Boylston Street, Boston, Massachusetts

TERMS

¶ Prices in this bulletin are net.

¶ Remit by express or post-office money order or by New York draft. Add twenty-five cents to face of all checks, except on New York or Boston, to cover collection charges.

REFERENCES

¶ Customers unknown to us must give satisfactory references, or send draft with order, for which we will allow five per cent discount. We will ship C. O. D., provided a remittance of twenty per cent accompanies order. Charges for return of money to be borne by purchaser.

¶ Goods will be delivered f. o. b. freight or express, Boston, Mass. No charge for packing. Each piece of apparatus is carefully packed and no allowance will be made for loss or breakage in transit.

¶ Western Union Telegraph code used. Telegraph and cable address, " Swettxray."

¶ When in Boston, we shall be glad to have you make your headquarters at our office.

BULLETINS

¶ We should be glad to send the following bulletins to all interested. Preceding bulletins are out of date.

Number Twenty-eight	Kinraide Coil and Accessories.
Number Twenty-nine	" Why ? " A List of Testimonials.
Number Thirty	Directions for Operating Coil.
Number Thirty-one	List of Sample Coil Outfits.
Number Thirty-two	Electrical Novelties
Number Thirty-three	This one.
Number Thirty-four	Finsen and Violet Ray Apparatus.

¶ This latter bulletin will be up-to-date and will include several new and improved pieces of apparatus. Be sure and get it before purchasing.

¶ Your special attention is called to the announcement on page 19 of this bulletin, and to note the greatly reduced price of the Kinraide Coil.

¶ Note rebate for return of tube terminals, on page 9.

¶ Prices in this bulletin supersede all others.

Copyrighted, 1903, by SWETT & LEWIS COMPANY

X-Ray Tubes

The question of X-ray tubes is a most important one, especially as many of the users are at so great a distance from the manufacturer. It is with pleasure we have to announce that we have been in the business of tube manufacture since early in 1896, and have sold many thousand satisfactory tubes.

We are better fitted now, than ever before, to supply tubes of all kinds, as the factory is equipped with new and improved machinery and a corps of skilled men. The tubes are made with great care and selected to fit each case.

The external terminals of all the tubes are very strong and heavy, and the user may rest assured that there will be no trouble from breakage at this point. The glass used is of the finest kind, and offers little or no obstruction to the passage of the X-ray.

In the following pages, we shall illustrate our standard tubes for various pieces of apparatus. Special tubes for experimental work to order.

The bulbs are all hand-blown, and are as thin as it is possible to get them, and yet be sure that they will withstand the atmospheric pressure and the shocks of shipment.

The bulbs are well proportioned, and are uniform in size. No very large bulbs are made, as our experience has shown that nothing is gained, and strength is sacrificed. A little calculation will show that the total pressure on a bulb of eight inches or more in size is enormous, and unless the walls of the tube are very thick, the danger of collapse is great. Thick walls mean obstruction to the rays.

Great care is taken in pumping all of the tubes manufactured by us, and as a result they have a nearly stable vacuum. This fact is a great help to the user.

Adjustable Vacuum Tubes

Adjustments may be divided into two classes; those which are dependent on a chemical as a means of lowering the vacuum, and those which are dependent on the porosity of a platinum tube. The tubes listed in this bulletin may be furnished either way, but with the static tubes the latter method is advised.

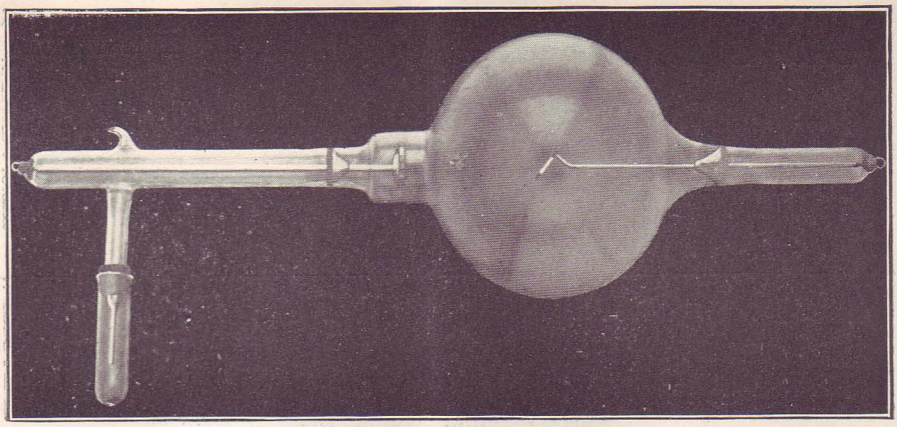
With the chemical adjustment, a glass tube is attached to the main or X-ray tube and partly filled with a chemical which gives off a gas when heated, and re-absorbs it on cooling.

Two methods may be used to operate this adjustment. The first is heating the adjusting bulb with the flame of a lamp or a match. The only objection to this is that too much gas may be driven off. The second, and better way, is to allow a spark from the coil or static to pass through the chemical. By this means, very close regulation may be had.

With the other regulator, a very thin platinum tube is sealed on to the main tube in the same position as the chemical regulator. When not in use, this regulating tube is protected against mechanical injury by a glass cap.

If the vacuum be too high, the platinum tube may be heated with a flame until it gets nearly or quite red hot. A little gas passes through the walls of the platinum tube into the X-ray tube and ceases instantly upon the removal of the flame. If the tube is excited while this is being done, the vacuum may be lowered to just the desired point. No gas is re-absorbed, so that there will be little or no rise in vacuum if the tube is allowed to stand. The opposite is true with the chemical regulator.

It is strongly advised that tubes be purchased with regulators of some kind as the life of the tube is much longer, better satisfaction is secured in operation and a large portion of the repair charges may be saved.



Type D, for Largest Static Machines

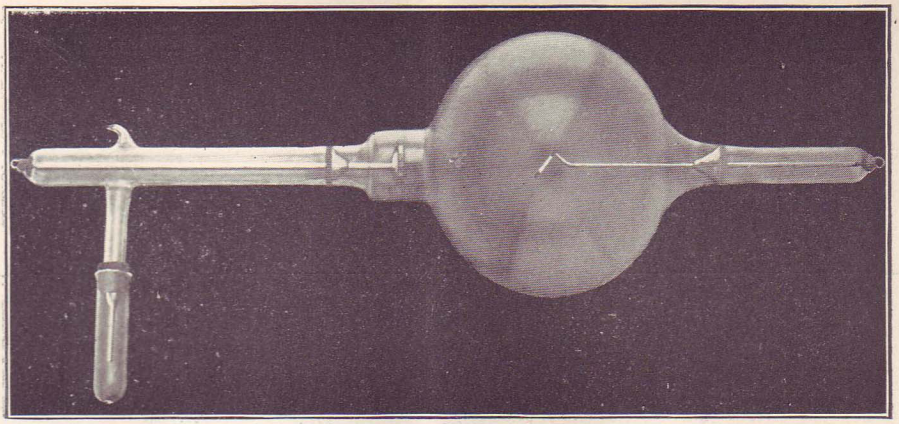
This tube is an improvement over the old Type J, which has been on the market for some years. The bulb is about five and one-half inches in diameter and the tube eighteen inches long. The great length is an advantage, as it prevents the current from passing over the outside of the glass, and prevents puncture.

The anode is of large size and supported in such a way that its surface is smooth, thus insuring sharp definition and accurate focus. The cathode is of good size, very thick, of proper curvature, and placed in proper relation to the walls of the tube.

Both anode and cathode terminals are supported near their entrance into the bulb, so that it is impossible to get them out of place without breaking the tube. This is an especially good tube for long distance shipments.

These tubes are specially recommended with the platinum regulator. When the regulator is used, they are sent out with a high vacuum, and may be lowered to just the right point to fit the machine and work in hand at that time.

Type D with adjustment	$11.00.	Code word, Demeterent
Type D without adjustment . . .	9.00.	Code word, Demeter



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Both anode and cathode terminals are supported near their entrance into the bulb, so that it is impossible to get them out of place without breaking the tube. This is an especially good tube for long distance shipments.

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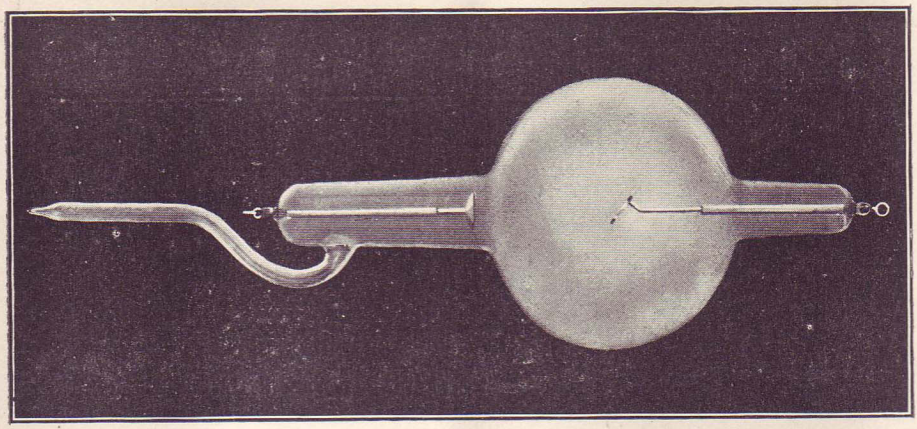
Type D with adjustment	$11.00.	Code word, Demeterent
Type D without adjustment . . .	9.00.	Code word, Demeter

The detail and definition obtainable are unsurpassed and the tube is bound to be a general favorite with all static machine users.

Type J will be no longer manufactured and the D tube will be sent in all cases when the older form is ordered.



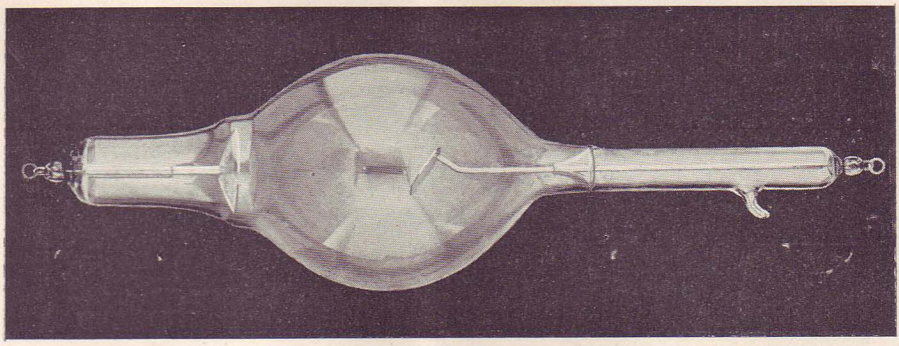
Type M, for Large Static Machines

This tube is probably as well known as any now on the market, and has been seen or used by the majority of X-ray operators.

The bulb is about five and one-half inches in diameter, and the tube, including handle, fifteen inches long. What was said regarding the terminals of Type D fully applies to this tube, except that they are not supported at their entrance to the bulb.

The tube is essentially for static use, and is without doubt the best on the market, for a low cost. The definition and detail obtained are excellent.

Price without adjustment	$8.00.	Code word, Demesnial
Price with adiustment	10.00.	Code word, Demetendum



Type W, for Medium Size Static Machines and Small Coils

This tube is really a small size D and is intended for static machines, of about six revolving plates, and small coils. Size, four inches in diameter, fourteen inches long.

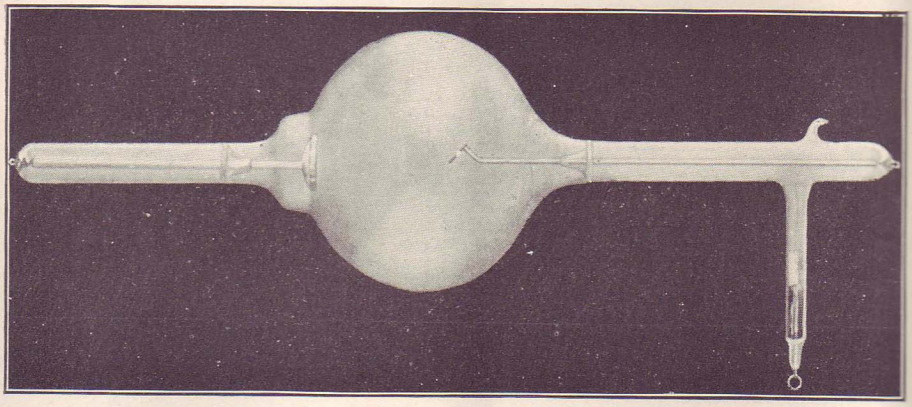
Price with adjustment	$8.75.	Code word, Demouvoir
Price without adjustment	6.75.	Code word, Demouler

Type S, for Small Static Machines and Coils

This tube is still smaller, being three and one-fourth inches in diameter and twelve inches long. Very many of these have been sold and are giving good satisfaction.

Price with adjustment	$7.00.	Code word, Dempsters
Price without adjustment	5.00.	Code word, Demoveo

The terminals of this tube are made with as great care as in the larger and more expensive tubes. This size is recommended for all small apparatus.



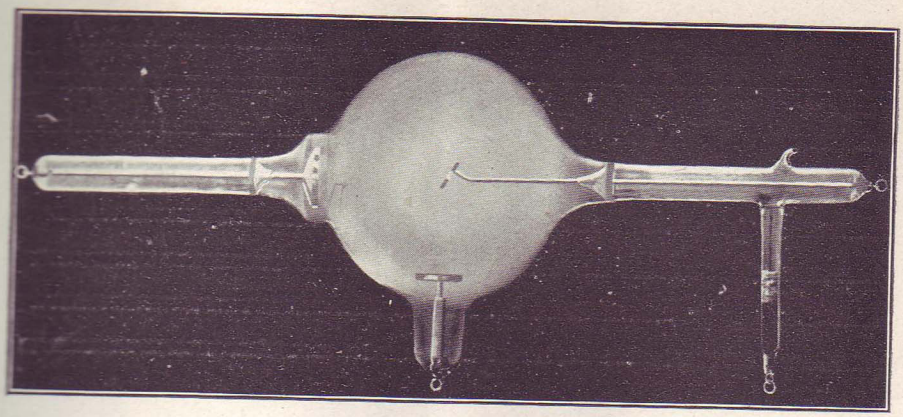
Type K, for Large Direct Current Coils

This tube is of the same size and shape as the Type D, but is designed for much heavier work. The anode is made of very heavy platinum, supported on a steel rod. It may be heated to a bright red, and held at this point for a long time without danger of injury to the tube or anode. The definition and penetration are exceptionally good.

The tube is fitted with a chemical adjustment, which may be operated either by heat or spark. The vacuum may be held at any desired point for long periods. If too much gas is driven off, it will be re-absorbed, if the tube is allowed to rest for a short time.

Price . . . . . $12.00. Code word, Delustro

The platinum tube regulator may also be used with this and the following tube, and will be furnished for the same price. In ordering, please specify which kind of regulator is desired. The chemical regulator will be furnished in all cases unless otherwise ordered.



Type H, for Alternating Current Coils only

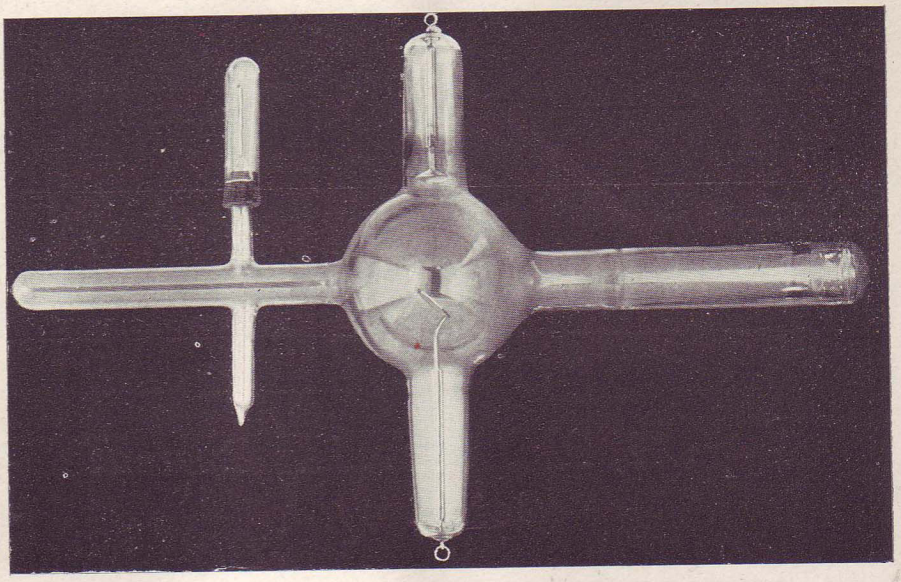
This tube is the same as Type K, except that a second cathode is placed back of the anode, and may be used in connection with the anode, or separately, as desired. If the second cathode is used as recommended, the life of this tube is much extended, and a large portion of the blackening is prevented. This tube will stand as hard usage as the previous one. The definition and penetration are fine.

Price	$14.00.	Code word, Delusively

A credit of ten per cent will be allowed from the purchase price of all tubes listed in this bulletin for the return of the complete terminals of a broken tube of the same kind.

This rebate will be allowed only toward the price of new tubes purchased at time of return of old terminals, and will in no case be paid in cash.

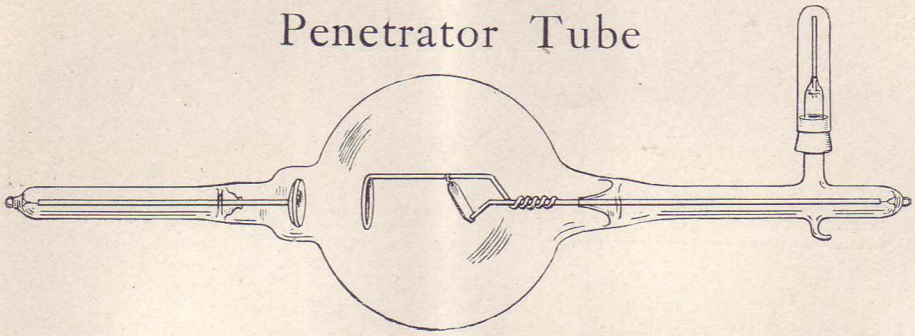
X-Ray Tubes for Cavities



To meet the demand for a tube that may be used in the throat or vagina, we have designed a simple, strong, and convenient one. The bulb and all but the end of the tube are made in such a way that they are opaque to the X-ray. The end of the tube, however, is transparent to the ray, and may be brought nearly, or quite, into direct contact with the diseased area. This reduces the time necessary for exposure, and increases the efficiency of the treatment. The terminals are so situated that the wires may be kept well away from the patient. The tube is substantially built, and the platinum tube regulator is supplied in all cases. This tube is recommended for work where small areas are to be treated, or for internal work.

Price	$14.00	Code word, Demureness

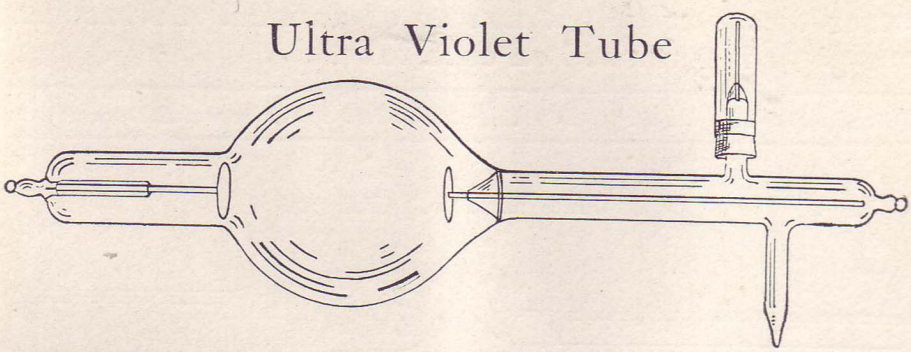
Penetrator Tube



Many users of tubes claim that the insertion of a ring of metal between the cathode and anode, and attached to the latter, will give the tube greater penetration at a low degree of vacuum.

This attachment may be added to any of the regular forms of tubes for an additional price of $0.75

Ultra Violet Tube



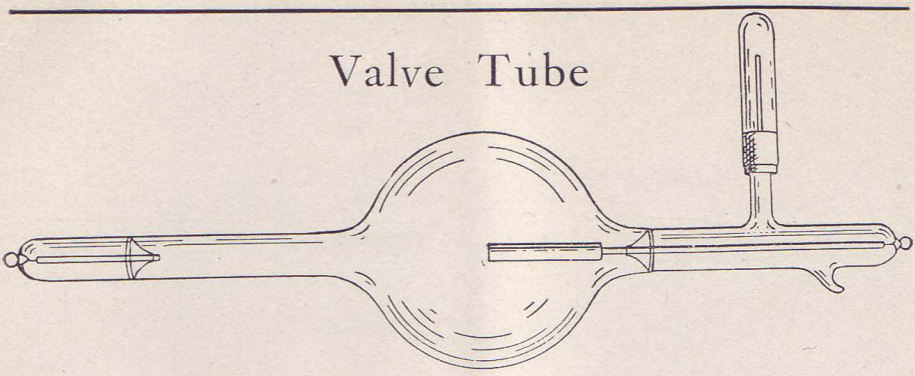
The above tube is filled with special gases before exhaustion and when excited by either a coil or static, in the same manner as an X-ray tube, gives off a great quantity of Ultra Violet rays.

A platinum barium cyanide screen will fluoresce brilliantly in any part of a large room with one of these tubes running.

A regulating device is furnished with this tube, as shown in cut, so that the vacuum may be held at any point. When running, the color effect in the tube is brilliant and striking. Useful in treating skin diseases.

Price . . . . . $7.00 Code word, Dentones

Valve Tube

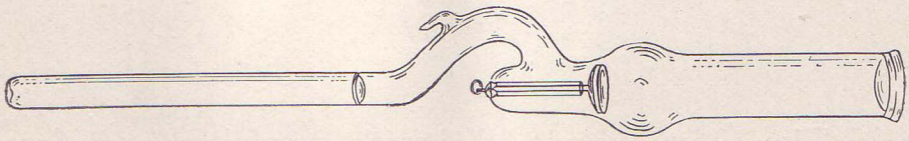


By introducing one of these tubes in series with an X-ray tube excited by a coil, many or all of the reverse waves may be chocked back or totally retarded. Tubes similar to this are much used by foreign operators.

The resistance of these tubes depends on the method of connection. With the current flowing in one direction it may be as high as three inches; in the other direction only a quarter of an inch. A vacuum regulator is furnished on each tube.

Price . . . . . $7.00 Code word, Depontabas

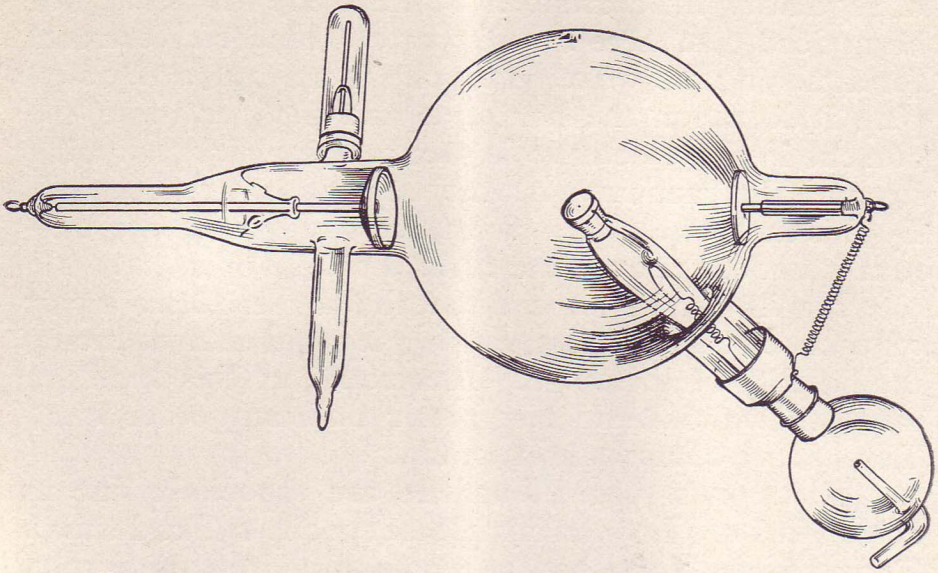
Lens Tube *(Patented)*



As shown in the illustration, the electrode is not dissimilar to No. 2, page 15, except that its end is flat and of crystal, which will allow the Ultra Violet rays to pass through the end of the tube only. Wherever the tube touches the patient, the high frequency effects are obtained and a plentiful stream of Ultra Violet rays is thrown through the lens. In ordering, state diameter wanted. It is manufactured in sizes up to one and a half inches in diameter. The electrode may be operated on either coil or static machine.

Price . . . . . $10.00 Code word, Desempeco

Water Cooled Tube



In this tube we have incorporated all the good points of our other tubes, including massive anode, supported cathode and the platinum tube adjustment.

A large amount of water is brought into direct contact with the anode, thus keeping it cool even under very hard usage. The water reservoir holds a comparatively large amount, affording a good opportunity for circulation. The tube may be run long and hard without lowering the vacuum.

Price	$30.00	Code word, Derivamos

A credit will be allowed for return of terminals in case of breakage.

Vacuum Electrodes

To meet the demand for a high-grade, substantial vacuum electrode, we have designed and manufactured those shown in the following cuts. These electrodes are made from a special glass, which prevents puncture. They are carefully pumped to the right degree of vacuum to produce the best color effects.

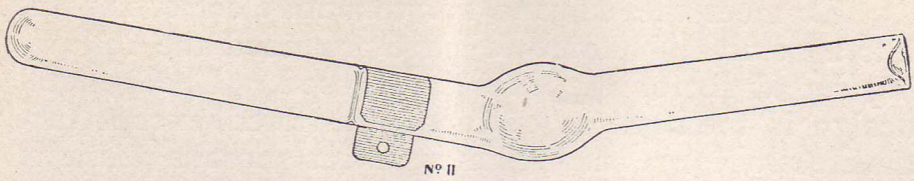
Special attention is called to the improved method of regulating the current in the electrode itself. It will be noticed that there is a copper clip on each electrode, for attaching the wire. This clip is movable. By slipping it down on the handle a half inch or more, the current in the electrode is weakened, and by slipping it up on the vacuum part, the current is strengthened. By this method of regulation, the strength of the current is under the absolute control of the operator.

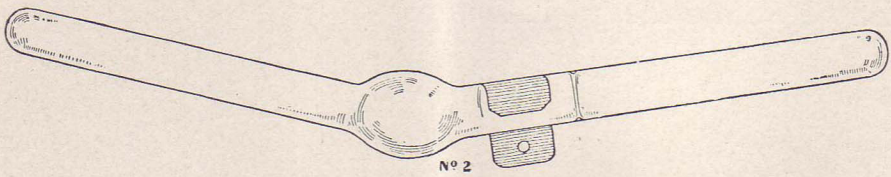
It will also be noticed that the handle forms a part of each electrode, thus making it rigid and reducing the liability of breakage. Electrodes of this kind are more substantial and last better than any other kind. The handle contains no vacuum.

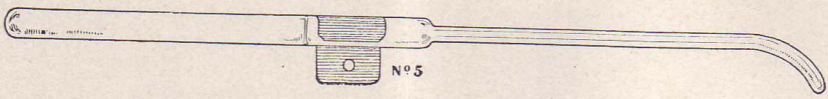
Electrodes Nos. 17 and 18 are especially fine in color effects. In ordering, please specify colors desired. They can be furnished in green, blue, red, or purple.

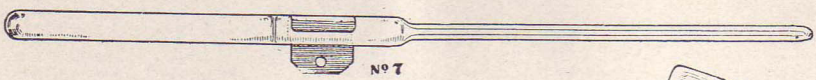
No. 14	For general application . .	$2.00.	Code word, Kræmerin
No. 2	For vaginal application . .	2.00.	Code word, Kræmpeln
No. 3	For rectal application . .	2.00.	Code word, Kræmpe
No. 11	For vaginal application, with cupped end . . .	2.00.	Code word, Krænkende
No. 5	For urethral application, with curved end	2.00.	Code word, Krænker
No. 7	For urethral application, straight,	2.00.	Code word, Krænklich
No. 15	For eye application . .	2.00.	Code word, Krænkung
No. 16	Double Eye Electrode . .	2.00.	Code word, Krætze
No. 19	Hammer Electrode . . .	2.00.	Code word, Krætzig
No. 18	Geissler Electrode, for general tonic treatment . . .	2.00.	Code word, Kourilien
No. 17	(Not so highly colored as No. 18)	2.00.	Code word, Kourgan
No. 1	For use around the spine. Shaped like a tuning fork .	2.00.	Code word, Krænseln
One pair Metal Handles and Cords .		1.00.	
Set of ten Electrodes, Metal Handles and Cords, ...		20.00.	Code word, Krænzen

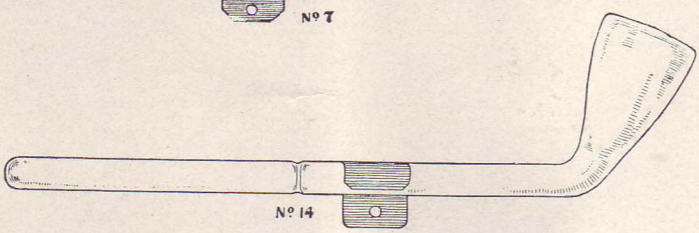
Electrode No. 19 is most useful, as its shape permits of its being used for a great variety of work.

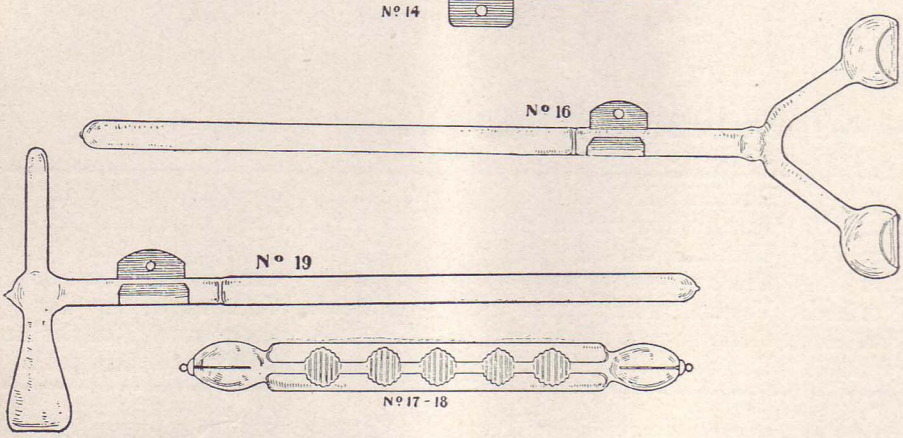


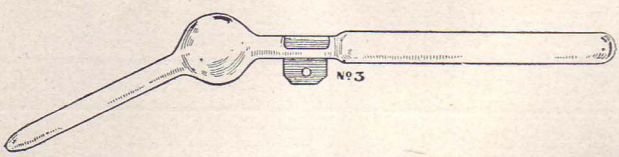






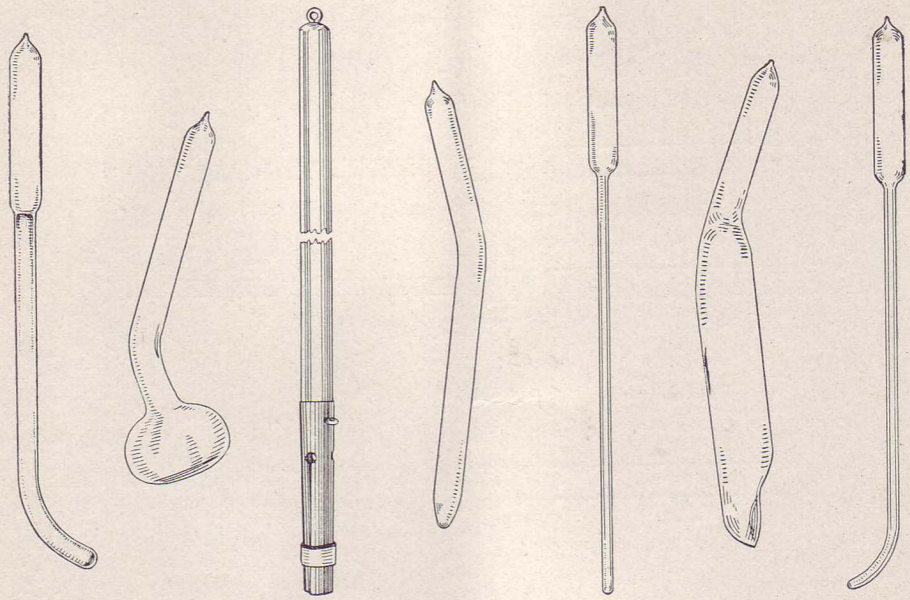






Vacuum Electrodes

To meet the demand for vacuum electrodes to fit into a common handle, we have produced the following set of six of the ones most used. The general design is the same as of those illustrated, except that the electrodes are made lighter, and as short as possible, and yet retain the good features.



The electrodes are as follows:

	Handle	$1.25.	Code word, Koulbac
No. 3A	Rectal (without bulb) . .	1.25.	Code word, Kouler
No. 5A	Urethral, curved . . .	1.25.	Code word, Koulougli
No. 7A	Urethral, straight . . .	1.25.	Code word, Koumiss
No. 11A	Vaginal, with cupped end .	1.25.	Code word, Koupara
No. 14A	General external work . .	1.25.	Code word, Koupholite
No. 20A	Eustachian	1.25.	Code word, Kourakin

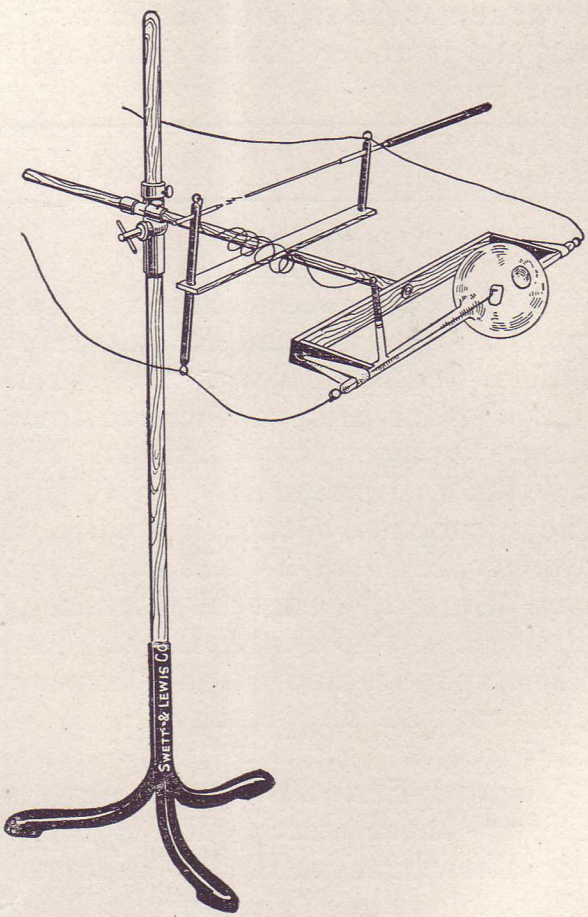
A firm insulating handle, fitted with a universal coupling, will complete the set.

Price for Set and Handle . . .	$5.00.	Code word, Koukarien

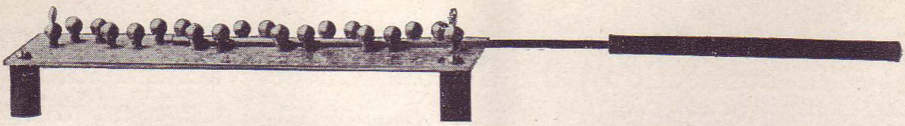
Special electrodes for any purpose, and of any shape, to order; price on application.

Tube Stands

In connection with the adjustable vacuum tubes using the chemical adjuster, and with those used with the Kinraide Coil, we would advise the floor tube stand shown in cut, as it has in combination with it a regulator so arranged that the vacuum in the tube may be held at any point desired.



Floor Tube Stand, with Adjustable Spark Gap,	$10.00	Code word, Finados
Set of Cords, heavily insulated . . .	1.00	Code word, Finances
Small Wood Tube Stand	2.00	Code word, Finage
Arm, 3 feet long, for use in place of ball and point in stand usually furnished with static machines	1.50	Code word, Finalista



Multiple Spark Interrupter

This device is specially valuable in running X-ray tubes from static machines. By its use a very low or very high vacuum tube may be made to light up in a fine manner, and is under instant and complete control of the operator.

Price each, complete, with full working directions . . . . . $5.00. Code word, Clisobra

Books

Electro-Static Modes of Application, Therapeutics, Radiography and Radiotherapy, by William Benham Snow, M.D. Price, $3.00

High-Frequency Currents in the Treatment of Some Diseases, by Chisholm Williams, F.R.C.S. Edinburgh. Price, . 2.75

Electro-Therapeutical Practice, by Chas. S. Neiswanger, Ph.G., M.D. Price, . . 1.50

Medical and Surgical Uses of Electricity, including the X-Ray, Finsen Light, Vibratory, Therapeutics and High-Frequency Currents, by A. D. Rockwell, A.M., M.D. Price, ... 5.00

Advanced Therapeutics. A Journal devoted to Electro-Therapeutics, Radiography, Thermo-Therapeutics, Hydro-Therapeutics, Climatology and Therapeutic Exercise. Price, per year, ... 2.00

Archives of the Roentgen Ray (London.) Price, per year, ... 4.00

Any of the above will be sent to any address, postage paid, on receipt of order. Cash must accompany the order.

Announcement

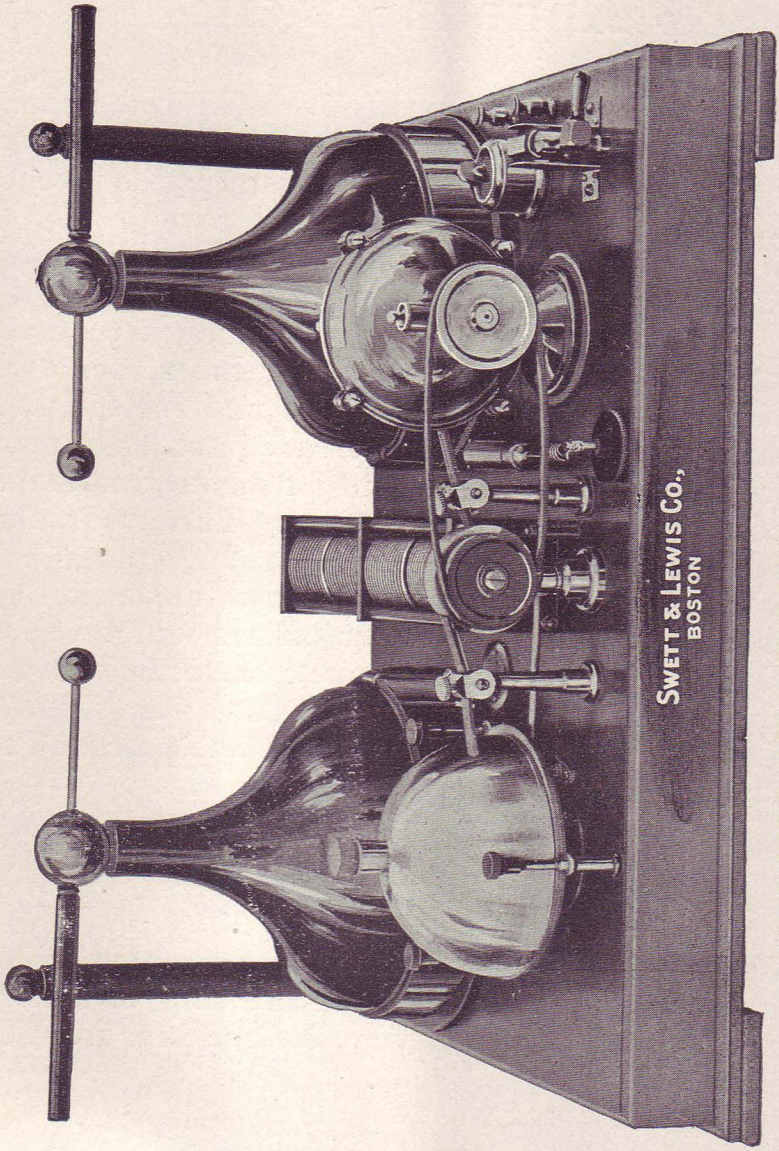
Your attention is respectfully called to the change in price of the Kinraide Coil and Coil Tubes. Owing to the very great demand for this apparatus, the inventor, Mr. Kinraide, has received more in royalties for his patents than was expected, and he has very kindly consented to give the medical profession the benefit of this. On our part, we, too, are making a reduction. We are able to do this largely for the reason that a number of very expensive moulds and special pieces of machinery which were necessary in order to manufacture the apparatus, have paid for themselves, making the cost of production much less. The apparatus is manufactured on the duplicate plan, all parts being interchangeable where possible, and made in large quantities. We hope that our efforts will be appreciated, and that you will continue to favor us with your orders. We wish to assure you that the quality will be fully maintained in the future, as in the past, and that the Coil will not be cheapened in any way.

Guarantee

With each Coil furnished, a guarantee will be given against any defect in workmanship or material, or against burn out in any way, for one year from date of shipment.

Construction

For full particulars regarding the construction of the Coil, we would refer you to pages 3 to 9, Bulletin No. 28. This Coil is one of the simplest pieces of X-ray

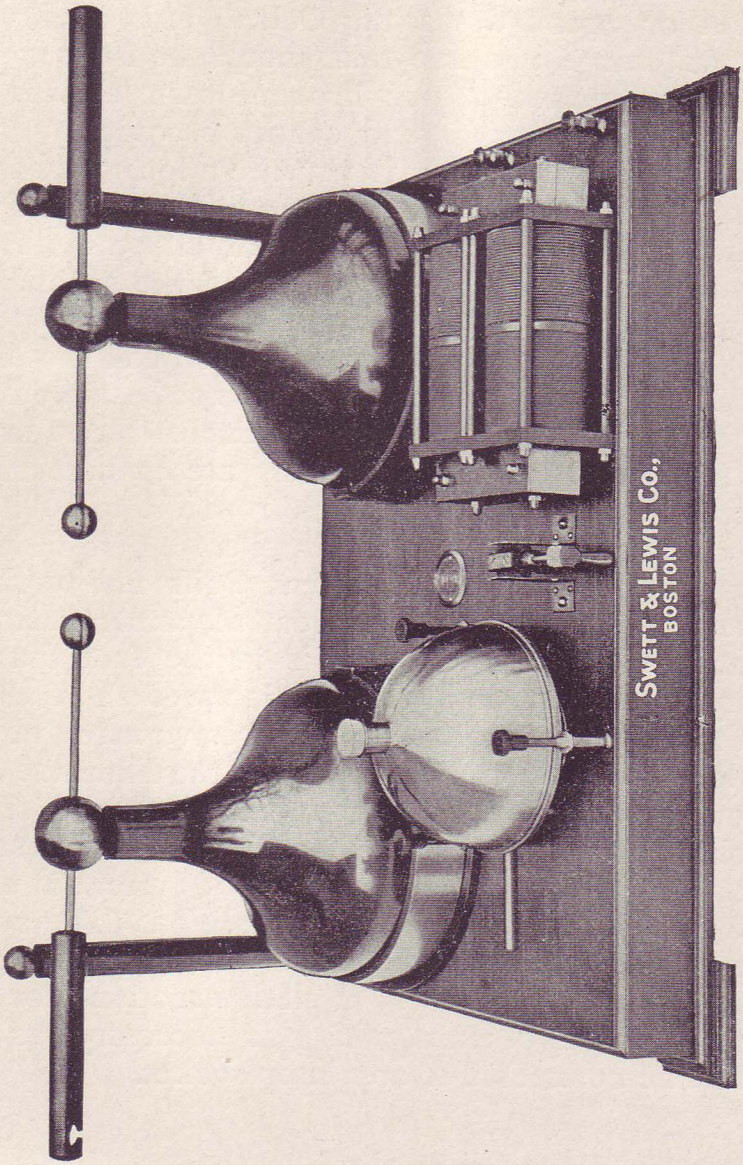


THE KINRAIDE HIGH FREQUENCY COIL, DIRECT CURRENT

apparatus yet put before the medical public. It is not only simple, but light, strong and compact. Owing to the peculiar method of construction, it is impossible to burn out or break down the Coil. This is a very important feature, and one that should be fully appreciated, as a burned-out or broken-down coil is an expensive thing to repair, and cannot be quickly done. This is specially important if you are a long way from base of supplies. A radical change is made in the construction of this Coil over that of all others, inasmuch as the primary is placed outside the secondary. The lines of force in the secondary all tend inward, which places the primary beyond the range of any high potential currents, and therefore it is not possible for a spark to jump to it, thus making it impossible to break down the secondaries. The Coils are manufactured for direct currents of all voltages from 110 to 500, and for all commercial alternating circuits. There need be no fear of the alternating current Coils not working with perfect satisfaction. A great advantage that the alternating Kinraide Coil has is in the fact that no mercury or electrolitic interrupter is used. The above are all more or less troublesome and have many objectionable features. The interrupter on the Kinraide Coil is very simple, easy of adjustment and is very durable. It consists of two large copper discs controlled by a small lever. An extremely small amount of current is used, so that the cost of operation is very slight. The entire apparatus is readily portable, and can be transported without risk of breakage. Full instructions for use are furnished. No extra wiring is necessary, as the Coil may be connected to any lamp socket.

Discharge

The current delivered from the Coil is of great volume, and of extremely high voltage, making it easy



THE KINRAIDE HIGH FREQUENCY COIL, ALTERNATING CURRENT

to do the finest kind of X-ray work, both in radiography and X-ray therapy. Another great advantage is that the current generated by the Coil is of the true high frequency variety, making no further piece of apparatus necessary, as this current may be applied direct to the patient, and all of the high frequency effects produced, either by means of vacuum or other electrodes, list of which is given on pages 14 to 16.

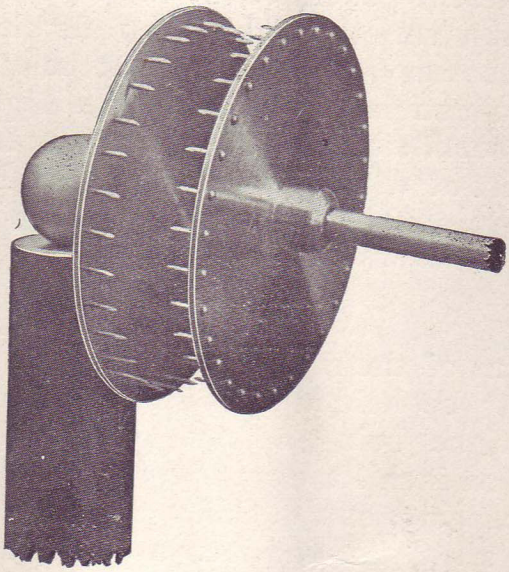
Control

By means of the rheostat, the current drawn from the Coil may be held under the absolute control of the operator, he being able to get anything from a spark about an inch long, and of very small volume, to the entire capacity of the Coil. This rheostat should be used on all Coils, and it is not only a help to the operator when using the vacuum electrodes, but it is of great assistance when manipulating X-ray tubes. The current is under the complete control of the operator at all times, and there is absolutely no danger of giving an unpleasant shock to the patient. The current delivered from the vacuum electrodes is smooth and even, and can be varied at will from the very lightest, which is entirely imperceptible to the patient, to one so strong as to produce the most violent contractions.

Points of Superiority

A few of these points are durability, reliability, simplicity, great power, low price, small cost of operation, portability, readiness for work, and the fact that it is not only a powerful X-ray generator, but also a high frequency machine as well. The combined Coil and Ultra Violet apparatus is the most compact, strongest and most powerful yet invented.

Spark Regulator for Coil



The cut shown above gives a good idea of this very useful attachment. It was designed specially for use with the Kinraide Coil, but may be used with any coil. Its special use is to introduce a resistance into the circuit with the patient or electrode, while using the high frequency electrodes. By its use the current may be regulated with great exactness.

Price	$4.00 per pair.	Code word, Clisson

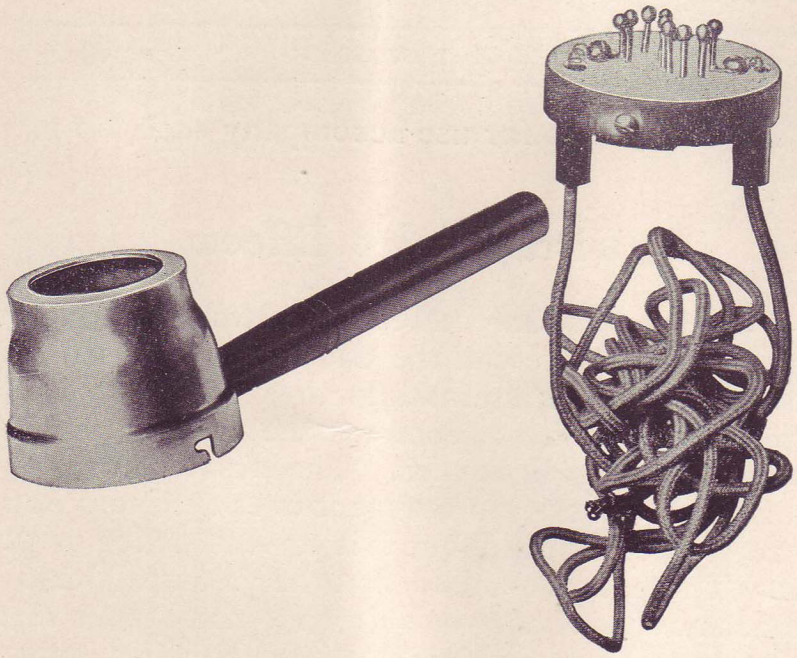
X-Ray Plates

5 x 7	$1.40 per dozen.	Code word, Einhergang
6½ x 8½	2.30 per dozen.	Code word, Einhuellen
8 x 10	3.40 per dozen.	Code word, Einimpfen
10 x 12	5.50 per dozen.	Code word, Einjæhrig
11 x 14	7.00 per dozen.	Code word, Einjagen

A supply of the above sizes always in stock. These plates are specially wrapped in light proof paper, no plate holder being required for use with the X-ray.

Spark Lamp

to Produce Ultra Violet Rays



The lamp is very simple, cannot get out of order, and may be run from a Kinraide Coil or static machine direct, without difficulty.

The base of the lamp is of slate. Cords are heavily insulated, so that there is no danger of the patient getting a shock by contact. The top is of brass, nicely nickeled. A hard rubber handle is attached so that the patient or operator may conveniently hold the lamp in position. The balls, across which the spark passes, are of iron. The lens is of the finest crystal and may be easily detached for the purpose of cleaning.

The whole lamp may be readily rendered antiseptic, as nothing but metal and crystal are brought near

the patient. It is almost noiseless in its operation, and may be held against the affected part in such a manner as to produce compression. In selecting a lamp, great care should be taken, as many lamps of this character are put out with glass lenses, which are almost, if not quite, opaque to the Ultra Violet ray.

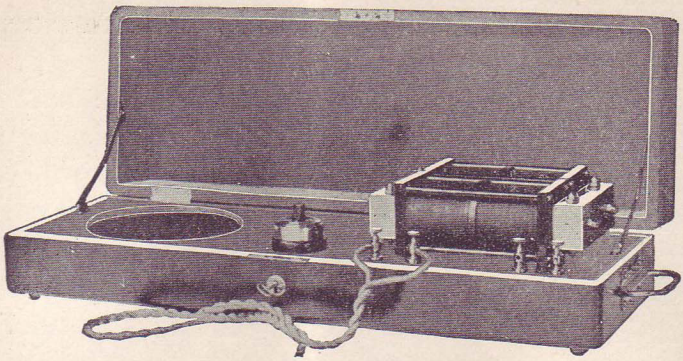
Price, complete with attaching cords, $10.00 Code word, Oggerunt

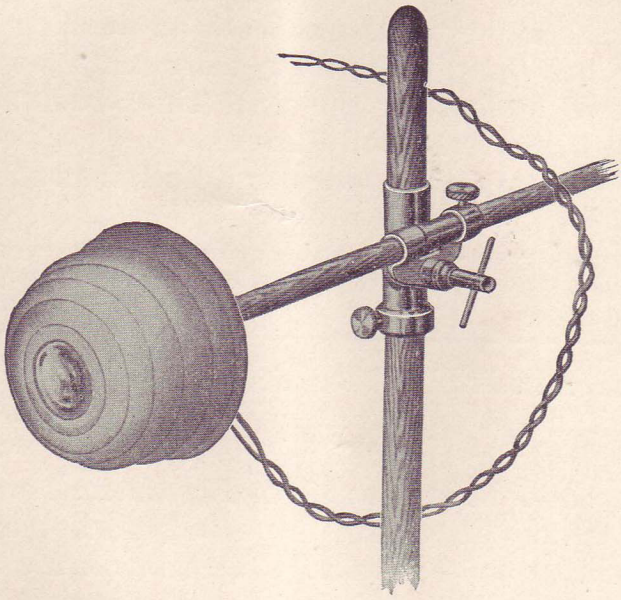
Full directions for use accompany each lamp.

Ultra Violet Effects

For more powerful effects the lamp manufactured by us, and which we call the Ultra, may be used by all who can obtain the alternating current. This wonderful piece of apparatus generates the true Ultra Violet rays with but few light rays. The lamp is, in reality, a modification of and improvement over the lamp known abroad as the "Bangs," but it is at least twice as powerful. There, it is claimed that the "Bangs" lamp has an efficiency varying from sixteen to sixty times that of the large arc lamps originally used for this purpose. In bringing out this lamp, we have placed in the hands of the physician an instrument of the highest power, and one that is fast winning a reputation for itself in this country. We have taken advantage of the fact that condenser currents of high voltage, when used in connection with iron electrodes, will produce the Ultra Violet rays with few light or heat rays.

This is really a diminutive arc lamp, entirely enclosed in a nice nickel case, and having in front a fine rock-crystal lens, which is perfectly transparent to the Ultra Violet ray. Instead of carbons, the electrodes of the lamp are of iron. They are regulated by a small thumb-screw at the back of the lamp, and are very easily adjusted. The lamp runs very quietly; with the





case removed a slight humming is heard. This lamp may be supported by any available stand. It is, however, designed with special reference to the floor stand illustrated on page 17 of this bulletin.

In connection with this stand, the lamp may be placed at any angle or height, and rotated in any direction with ease. The patient may be brought near to or touching the lens, so that the rays may be brought into direct contact with the desired area. Very little heat is generated and no cooling or color-

ing device is necessary. The whole case of the lamp may be readily detached and boiled for the purpose of sterilization if desired.

Few light rays are given off, but the arc is very rich in invisible Ultra Violet rays, so much so that the eyes must be protected with glasses or some opaque substance at all times when near the lamp. Tests show that this lamp produces many times the quantity of the true Ultra Violet rays generated by any other lamp on the market, not excepting the largest arcs in use. This, too, at very small expense.

The cost of running a lamp of this sort will not exceed six to eight cents per hour at the average cost of the electric light, while a large arc lamp may cost as much as two dollars for the same time, besides necessitating special wiring and fixtures.

Twelve extra electrodes and full instructions for use go with each lamp.

Price complete, as shown in cut, with stand for supporting lamp	$110.00
Price without stand	100.00

A special stand is furnished with this lamp. The stand is of brass, very nicely finished, and allows the lamp to be held in any desired position.

Lamp now built for alternating current only.

The lamp which forms a part of this apparatus can be attached to any Kinraide Coil, run on the alternating circuit. It will, however, be necessary to send the Coil to our factory in order to have the necessary switches put on and changes made. This can be done without detriment to the working of the Coil. This lamp cannot be applied to the direct current Coils.

Ultra Lamp, connecting cord, switches, and all necessary attachments fitted to any alternating current Kinraide Coil, new or old, for	$50.00

Freight or express charges to be paid by owner of Coil.

For the Coil and Ultra combination, prefix the letter U to the Code Word for the coil of proper voltage and cycle. Thus: UKoperig, meaning a Kinraide Coil and Ultra combined and designed to run on a circuit of 52 volts and 7200 alternations.

Price List

COILS

The Kinraide Induction Coil	$130.00
(Direct and alternating currents of all voltages from 110 to 250)	
500-Volt Coils, extra	20.00
Alternating Current Coil and Ultra combined	175.00

CODE WORDS

52 volts, 7,200 Alternations	Koperig
104 volts, 7,200 Alternations	Kopernikus
110 volts, 7,200 Alternations	Koperkies
52 volts, 16,000 Alternations	Koperkleur
110 volts, 16,000 Alternations	Kopermolen
110 volts, 15,000 Alternations	Kopermunt
110 volts, Direct Current	Intardatum
220 volts, Direct Current	Intardetis
235 volts, Direct Current	Intarlando
250 volts, Direct Current	Intarlare
500 volts, Direct Current	Intarlato

TUBES

K Tube for Direct Current Coil (code word, Delustro)	$12.00
H Tube for Alternating Current Coil only (code word, Delusively)	14.00
Insulating Cords, for connecting Tubes, per set	1.00

An allowance, towards the price of new apparatus, will be made for the return of the complete terminals of either of the above tubes. See page 9.

FLUOROSCOPES

Platinum Barium Cyanide Fluoroscope, 4 x 5 (code word, Eapse)	$ 8.00
Platinum Barium Cyanide Fluoroscope, 5 x 5 (code word, Earinus)	10.00
Platinum Barium Cyanide Fluoroscope, 5 x 7 (code word, Earshrift)	12.50
Platinum Barium Cyanide Fluoroscope, 6 x 6 (code word, Earthiness)	13.00
Platinum Barium Cyanide Fluoroscope, 6 x 8 (code word, Earthling)	16.00
Platinum Barium Cyanide Fluoroscope, 8 x 10 (code word, Earthly)	24.00

FLOOR TUBE STAND

Floor Tube Stand, with Adjustable Spark Gap (code word, Finados) $10.00

TABLE

A Finely Polished Quartered Oak Table large enough for either of the foregoing outfits, and equipped with ball-bearing castors (code word, Firmandos) 12.00

RHEOSTAT

Rheostat 8.00

BLOCK TIN

Block Tin for X-Ray Shields (code word, Blemmyer) per lb. . . .25

This material comes fifteen inches wide and a strip three feet long makes a pound.

In using code words for outfits prefix the code word denoting voltage, etc., of coil. See page 29.

OUTFIT NUMBER THIRTY-THREE

(Code word, Unpublic)

For Direct Current:		
One Direct Current Kinraide Coil	$130.00	
Two Tubes, Type K	24.00	
One 5 x 7 Platinum Barium Cyanide Fluoroscope .	12.50	
One Floor Tube Stand	10.00	
One Rheostat	8.00	
		$184.50

OUTFIT NUMBER THIRTY-FOUR

(Code word, Vestifluam)

For Alternating Current:		
One Alternating Current Kinraide Coil . . .	$130.00	
Two Tubes, Type H	28.00	
One 5 x 7 Platinum Barium Cyanide Fluoroscope .	12.50	
One Floor Tube Stand	10.00	
One Rheostat	8.00	
		$188.50

OUTFIT NUMBER THIRTY-FIVE

(Code word, Unpunished)

For Direct Current:		
One Direct Current Kinraide Coil	$130.00	
Two Tubes, Type K	24.00	
One 6 x 8 Platinum Barium Cyanide Fluoroscope	16.00	
One Rheostat	8.00	
One Floor Tube Stand	10.00	
Four pounds of Block Tin	1.00	
One pair of Spark Regulators	4.00	
One set of six Vacuum Electrodes	5.00	
		$198.00

OUTFIT NUMBER THIRTY-SIX

(Code word, Vestigabas)

For Alternating Current:		
One Alternating Current Kinraide Coil	$130.00	
Two Tubes, Type H	28.00	
One 6 x 8 Platinum Barium Cyanide Fluoroscope	16.00	
One Rheostat	8.00	
One Floor Tube Stand	10.00	
Four pounds of Block Tin	1.00	
One pair of Spark Regulators	4.00	
One set of six Vacuum Electrodes	5.00	
		$202.00

OUTFIT NUMBER THIRTY-SEVEN

(Code word, Timindos)

For Alternating Current:		
One Alternating Current Kinraide Coil and Ultra Violet Apparatus combined	$175.00	
Two Tubes, Type H	28.00	
One 5 x 7 Platinum Barium Cyanide Fluoroscope	12.50	
One Floor Tube Stand	10.00	
One Rheostat	8.00	
		$233.50

OUTFIT NUMBER THIRTY-EIGHT

(Code word, Tronconner)

For Direct Current:		
One 500 Volt Kinraide Coil	$150.00	
Two Tubes, Type K	24.00	
One 5 x 7 Platinum Barium Cyanide Fluoroscope	12.50	
One Floor Tube Stand	10.00	
One Rheostat	15.00	
		$211.50

OUTFIT NUMBER THIRTY-NINE

(Code word, Timenoguy)

For Alternating Current:		
One Alternating Current Kinraide Coil and Ultra Violet Apparatus combined	$175.00	
Two Tubes, Type H	28.00	
One 6 x 8 Platinum Barium Cyanide Fluoroscope	16.00	
One Floor Tube Stand	10.00	
One Rheostat	8.00	
One Quartered Oak Table	12.00	
One pair of Spark Regulators	4.00	
One set of Vacuum Electrodes	5.00	
		$258.00

OUTFIT NUMBER FORTY

(Code word, Timeous)

One Alternating Current Kinraide Coil and Ultra Violet Apparatus built on a fine cabinet	$225.00	
Two Type H Tubes	28.00	
One 6 x 8 Platinum Fluoroscope	16.00	
One Floor Tube Stand	10.00	
One Rheostat	8.00	
One set of ten Electrodes all glass	20.00	
		$307.00
Without Ultra Violet Attachments (code word, Timeously)		$262.00

OUTFIT NUMBER FORTY-ONE

(Code word, Unpurged)

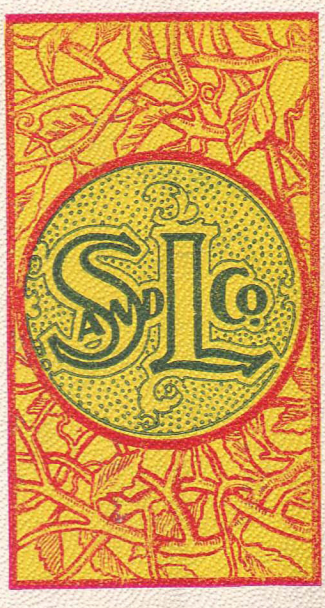
One Direct Current Kinraide Coil built on a fine cabinet	$180.00	
Two Type K Tubes	24.00	
One Floor Tube Stand	10.00	
One 6 x 8 Platinum Fluoroscope	16.00	
One Rheostat	8.00	
One set of ten Electrodes all glass	20.00	
		$258.00

The Cabinet used in above outfits is of quartered oak, finely finished, its top forming the base for the coil, which cannot be removed.

Drawers are furnished to hold tubes, electrodes, and supplies.

The whole is mounted on large rubber-covered rollers.

This makes a very fine and impressive instrument, and is an ornament to any office.



PRESS OF
MURRAY
AND
EMERY
COMPANY

Novelties

Swett & Lewis Company

Boston Massachusetts

BULLETIN THIRTY-TWO

Electrical Novelties

The Ultra
Vacuum Electrodes
X-Ray Tubes and Stands
The Multiple Spark Interrupter
Spark Lamp to Produce Violet Rays
Spark Regulator for Coil
Electric Heaters
X-Ray Plates

Swett & Lewis Company

Eighteen Boylston Street, Boston, Massachusetts

1903

Terms

Prices in this catalogue are net.

Remit by express or post office money order or by New York draft. Add twenty-five cents to face of all checks, except on New York or Boston, to cover collection charges.

References

Customers unknown to us must give satisfactory references, or send draft with order, for which we will allow five per cent discount. We will ship C. O. D., provided a remittance of twenty per cent accompanies order. Charges for return of money to be borne by purchaser.

Goods will be delivered f. o. b. freight or express, Boston, Mass. No charge for packing. Each piece of apparatus is carefully packed and no allowance will be made for loss or breakage in transit.

Western Union Telegraph code used. Telegraph and cable address, "Swettxray."

When in Boston, we shall be glad to have you make your headquarters at our office.

Copyrighted, 1903, by Swett & Lewis Company

Vacuum Electrodes

To meet the demand for a high grade, substantial vacuum electrode, we have designed and manufactured those shown in the following cuts. These electrodes are made from a special glass, which prevents puncture. They are carefully pumped to the right degree of vacuum to produce the best color effects.

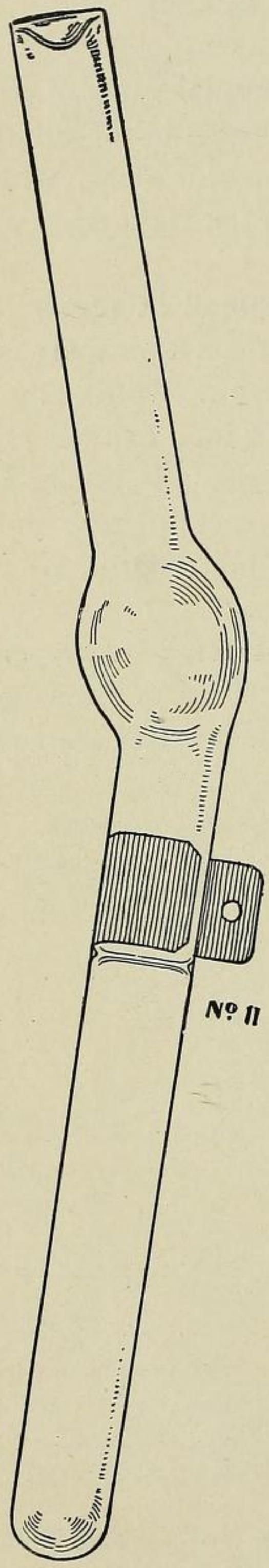
Special attention is called to the improved method of regulating the current in the electrode itself. It will be noticed that there is a copper clip on each electrode for attaching the wire. This clip is movable. By slipping it down on the handle a half inch or more, the current in the electrode is weakened, and by slipping it up on the vacuum part, the current is strengthened. By this method of regulation, the strength of the current is under the absolute control of the operator.

It will also be noticed that the handle forms a part of each electrode, thus making it rigid and reducing the liability of breakage. Electrodes of this kind are more substantial and last better than any other kind. The handle contains no vacuum.

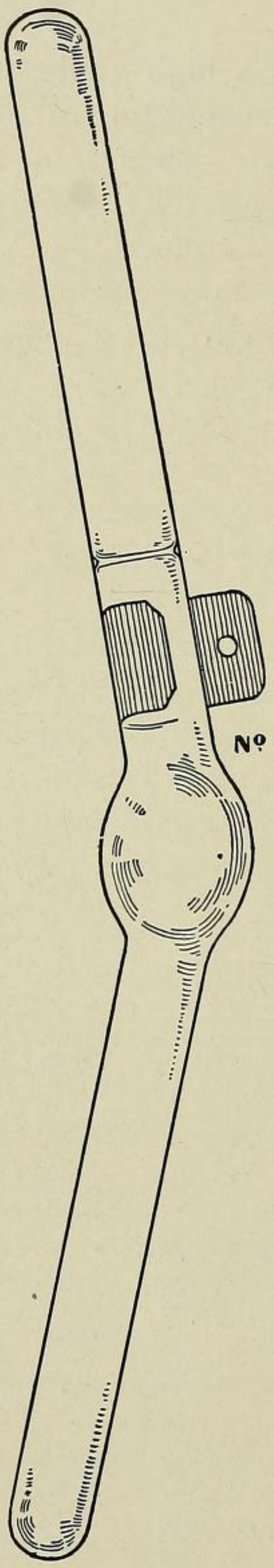
Electrodes Nos. 17 and 18 are specially fine in color effects. In ordering, please specify colors desired. They can be furnished in green, blue, red, or purple.

Vacuum Electrodes for High Frequency Work

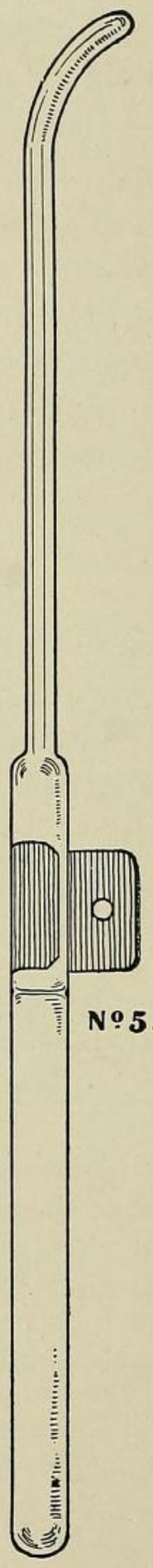
No. 14	For general application . .	$2.00.	Code Word — Kræmerin
No. 2	For vaginal application . .	2.00.	Code Word — Kræmpeln
No. 3	For rectal application . .	2.00.	Code Word — Kræmpe
No. 11	For vaginal application, with cupped end	2.00.	Code Word — Krænkende
No. 5	For urethral application, with curved end	2.00.	Code Word — Krænker
No. 7	For urethral application, straight,	2.00.	Code Word — Krænklich
No. 15	For eye application . . .	2.00.	Code Word — Krænkung
No. 16	Double eye electrode . . .	2.00.	Code Word — Krætze
No. 19	Hammer electrode . . .	2.00.	Code Word — Krætzig
No. 18	Geissler electrode, for general tonic treatment . . .	2.50.	Code Word — Kourilien
No. 17	(Not so highly colored as No. 18)	1.50.	Code Word — Kourgan



No 11



No 2



No 5.

No 7

Electrode No. 19 is most useful, as its shape permits of its being used for a great variety of work.

One pair metal handles and cords . . . $1.00.
Set of ten electrodes, metal handles and cords, 20.00. Code Word — Krænzen

To meet the demand for vacuum electrodes to fit into a common handle, we have designed the following set of six of the ones most used. The general design is the same as of those illustrated, except that the electrodes are made lighter, and as short as possible, and yet retain the good features.

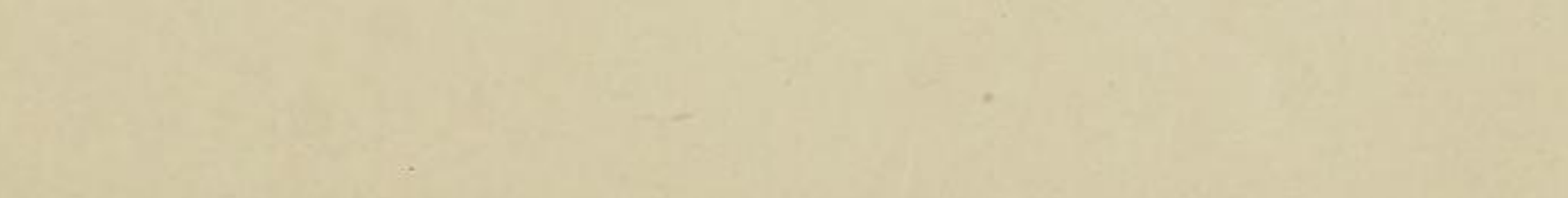
The electrodes are as follows:

	Handle	$1.25.	Code Word — Koulbac
No. 3A	Rectal (without bulb) . .	1.25.	Code Word — Kouler
No. 5A	Urethral, curved . . .	1.25.	Code Word — Koulougli
No. 7A	Urethral, straight . . .	1.25.	Code Word — Koumiss
No. 11A	Vaginal, with cupped end .	1.25.	Code Word — Koupara
No. 14A	General external work . .	1.25.	Code Word — Koupholite
No. 20A	Eustachian	1.25.	Code Word — Kourakin

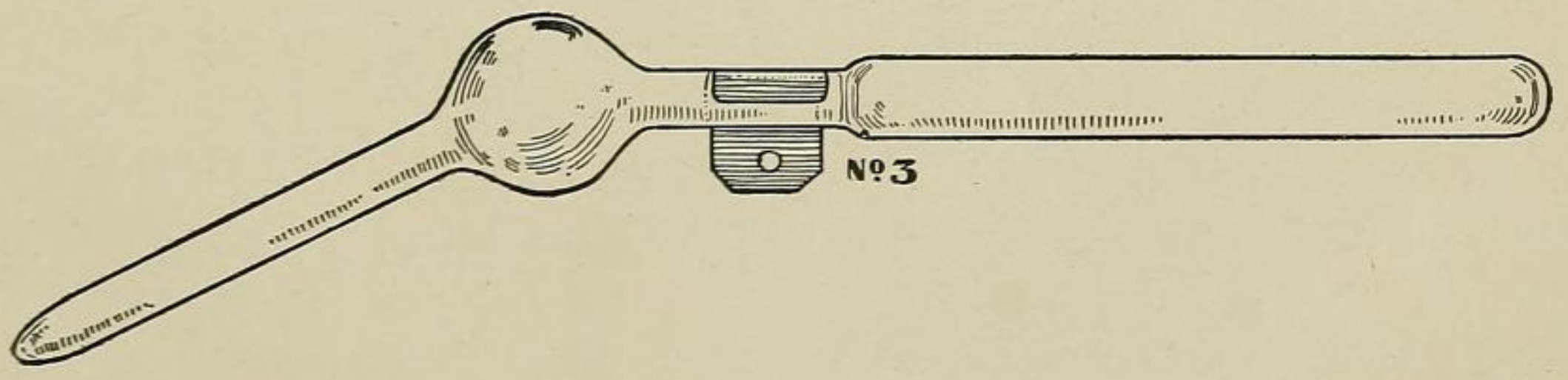
A firm insulating handle, fitted with a universal coupling, will complete the set.

Price for set and handle . . $8.00. Code Word — Koukarien

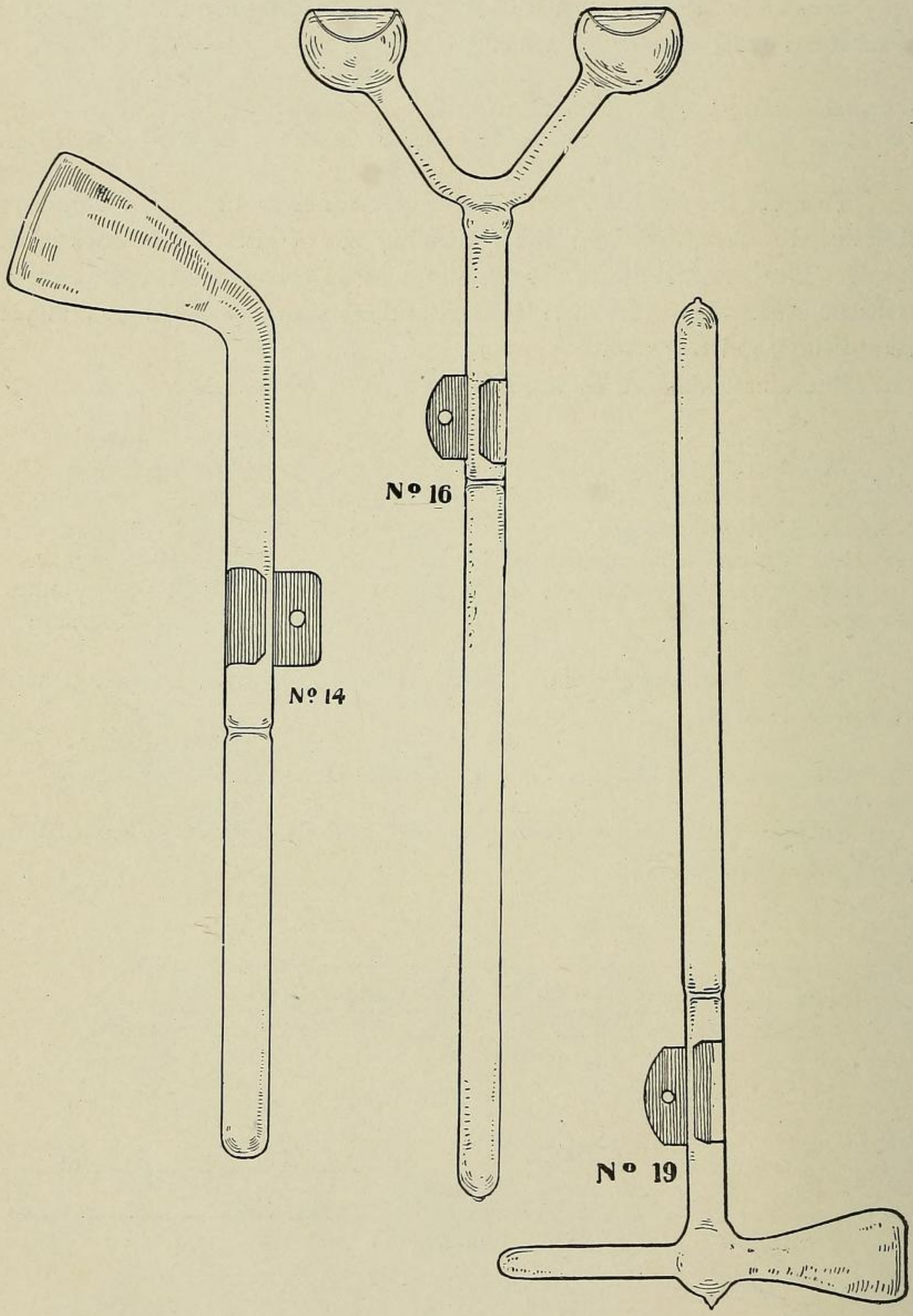
Special electrodes for any purpose, and of any shape, to order; price on application.



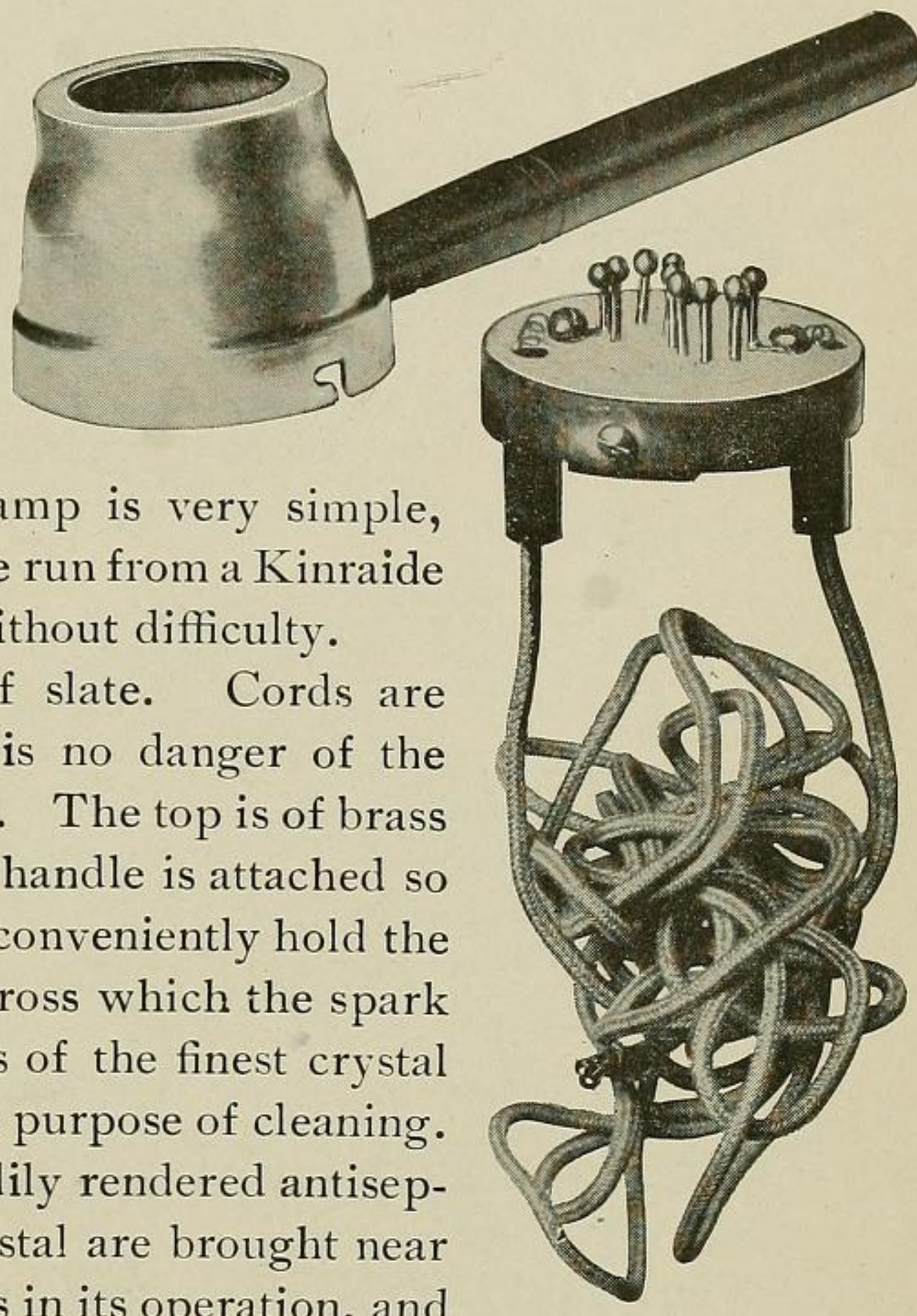
Nº 17 - 18



Nº 3


No 16
No 14
No 19

Spark Lamp to Produce Ultra Violet Rays



The little lamp shown in the cut above is not a mere plaything, although it is small and of low price. Lamps of this sort have been in use abroad for several years, and good results have been obtained from them in cases of lupus, epithelioma, erysipelas, eczema, etc. The lamp is very simple, cannot get out of order, and may be run from a Kinraide Coil or Static Machine direct, without difficulty.

The base of the lamp is of slate. Cords are heavily insulated, so that there is no danger of the patient getting a shock by contact. The top is of brass nicely nickeled. A hard rubber handle is attached so that the patient or operator may conveniently hold the lamp in position. The balls, across which the spark passes, are of iron. The lens is of the finest crystal and may be easily detached for the purpose of cleaning.

The whole lamp may be readily rendered antiseptic, as nothing but metal and crystal are brought near the patient. It is almost noiseless in its operation, and may be held against the affected part in such a manner as to produce compression. In selecting a lamp, great care should be taken, as many lamps of this character are put out with glass lenses, which are almost opaque to the Ultra Violet ray, if not quite so.

Price, complete with attaching cords, $10.00. Code Word — Oggerunt

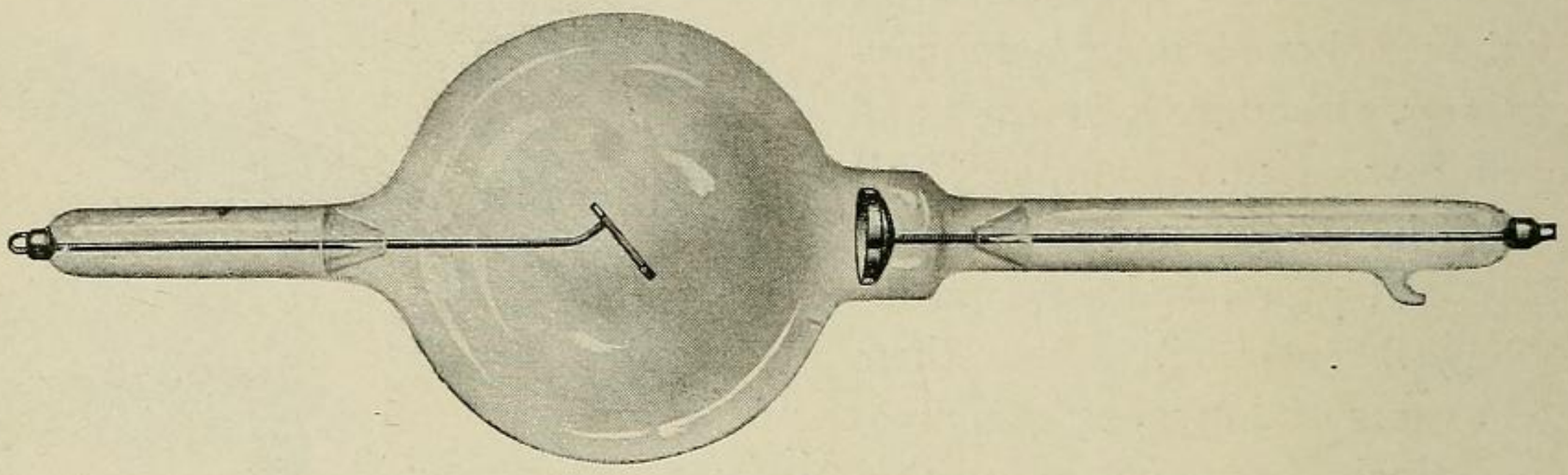
Full directions for use accompany each lamp.

Complete catalogue of Violet ray apparatus on application.

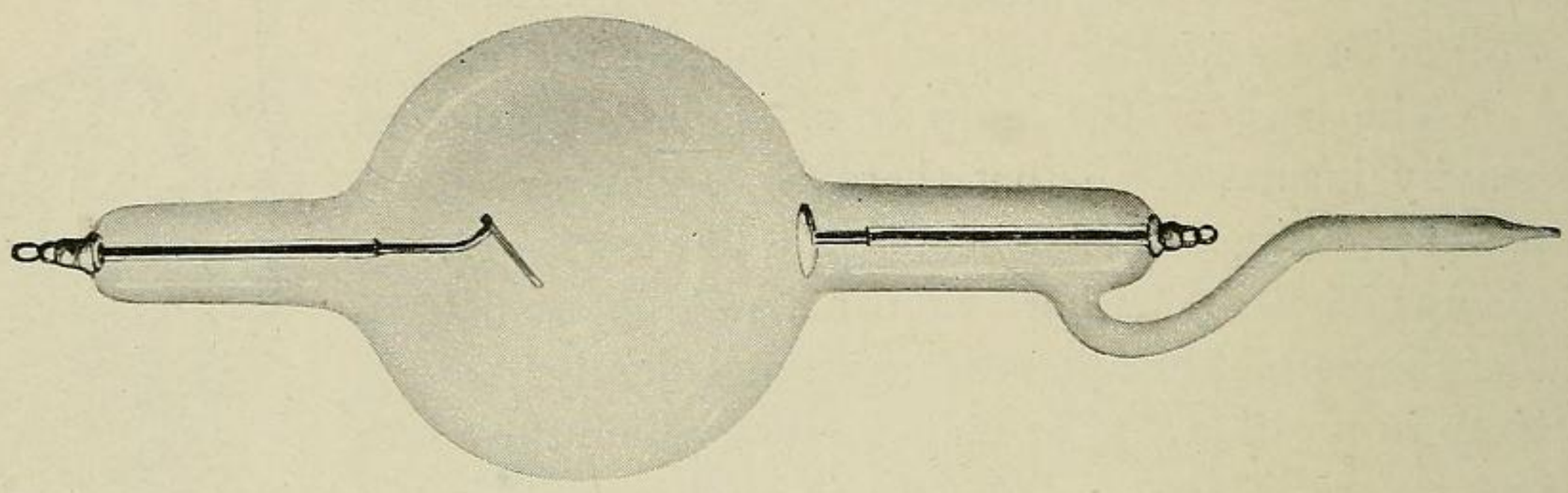
The spark lamp may be used in connection with an ordinary Ruhmkorff coil, if our set of extra strong condensers are used. The set consists of a pair of large, specially constructed jars, properly connected and fitted into a fine mahogany box, complete with suitable connections.

Price, with full directions for use, $14.00. Code Word — Iaspidis

X-Ray Tubes



Type D



Type M

But two kinds will be mentioned here. If interested, send for bulletin No. 33 on tubes.

The above tubes are specially designed for Static Machine work. Type M is an old familiar one, and many thousands of these tubes are now in use to-day. It has lately been improved in design and arrangement of terminals.

Type D. This tube is an improvement over the old form of J tube, inasmuch as the ends are of equal length and both electrodes are supported where they enter the bulb of the tube, thus preventing any chance of becoming loose or breaking down in use or transit. The definition and penetration are unexcelled. If desired, Type D may be furnished with an adjustment for regulating the vacuum.

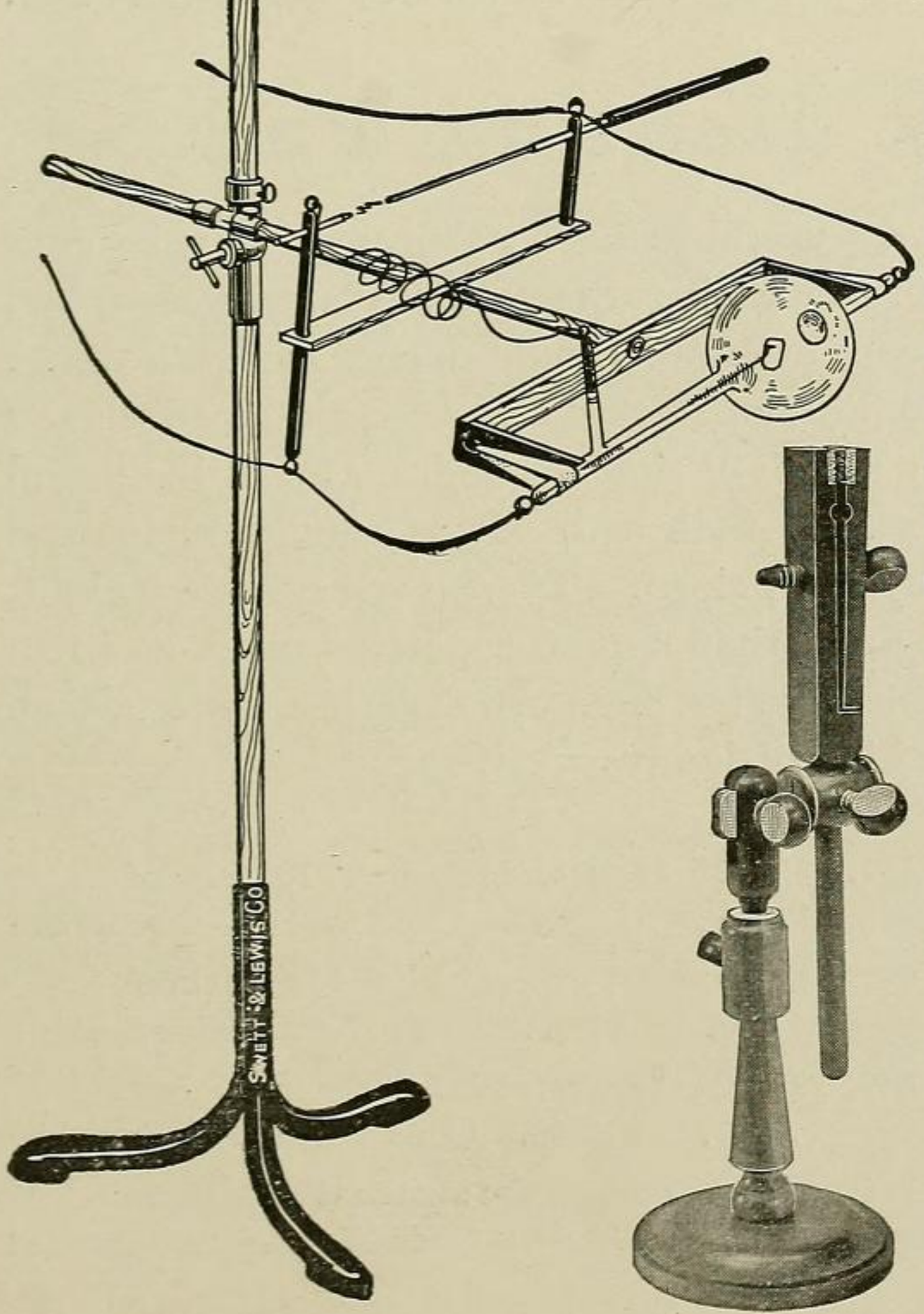
Type M	$8.00.	Code Word — Demesnial
Type D	10.00.	Code Word — Demeter
Adjustable Type D . .	12.00.	Code Word — Demeterent

X-Ray Tubes for Cavities

To meet the demand for a tube that may be used in the throat or vagina, we have designed a simple, strong, and convenient tube. The bulb and all but the end of the tube are made in such a way that it is opaque to the X-ray. The end of the tube, however, is transparent to the ray, and may be brought nearly or quite into direct contact with the diseased area. This reduces the time necessary for exposure and increases the efficiency of the treatment. The terminals are so situated that the wires may be kept away from the patient. The tube is substantially built, and a method of reducing the vacuum is supplied.

Price . . . . . $18.00. Code Word — Demureness

Tube Stands



In connection with the adjustable vacuum tube, we would recommend the tube stand shown in cut, as it has in combination with it a regulator so arranged that the vacuum in the tube may be held at any point desired.

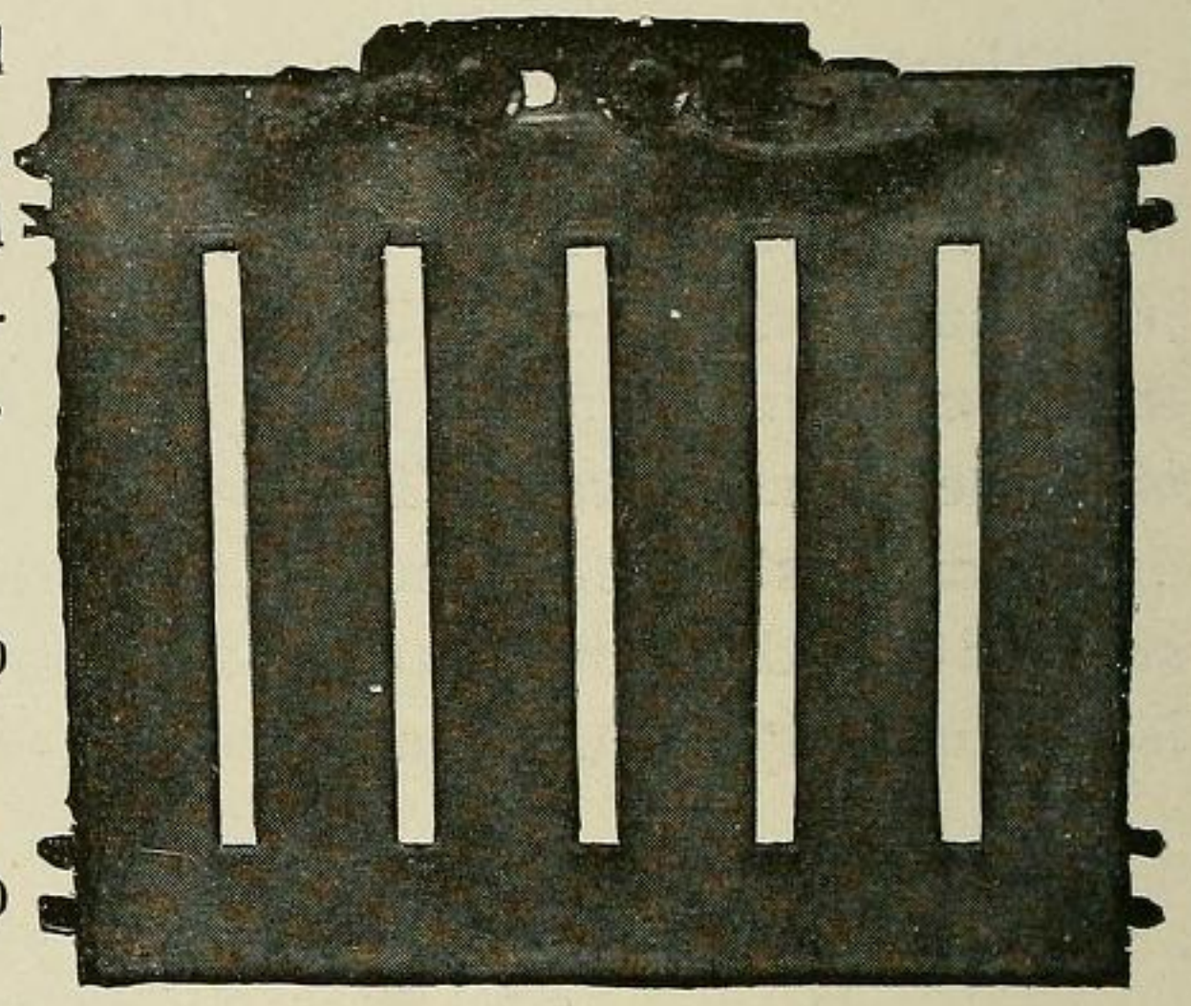
Floor tube stand, with adjustable spark gap, $10.00
Code Word — Finados

Set of cords, heavily insulated, $1.00
Code Word — Finances

Small wood tube stand, $2.00
Code Word — Finage

Arm, 3 feet long, for use in place of ball and point in stand usually furnished with Static Machines, $1.50
Code Word — Finalista

Electric Heater



This is specially designed for drying out Static Machines, and when used properly will keep a Static Machine in running order every day in the year.

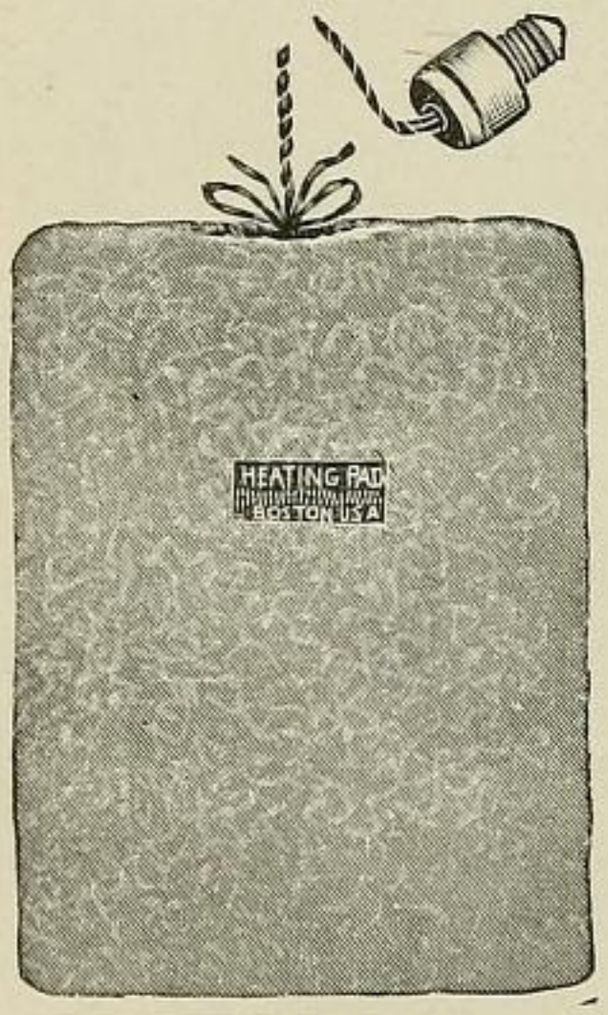
Heater, special cord, switch, 10-lb. can of fused calcium chloride, with instructions for use, $10.00
Code Word — Chuana

Ten-pound can of fused calcium chloride, extra dry . $1.50
Code Word — Chubbed

In ordering, state voltage of electric circuit on which heater is to run.

Electric Heating Pad

The cut shows this very useful article. This pad may be connected by means of the cord and plug direct to the lamp socket, and allowed to run for any length of time without danger of overheating, or shock to the patient. The temperature may be maintained at 180 degrees Fahrenheit for any length of time desired. The pad is useful in any condition where heat is indicated. It is soft, flexible, and easily kept clean. There is very little weight, not more than a quarter part as much as in an ordinary water bag. In ordering, state voltage and kind of lamp socket.



No. 681. 12 x 15 inches, including 10 feet of cord and plug, $5.00. Code Word — Cauponate

No. 682. Same as 681 except switch to give three degees of heat, $7.50. Code Word — Cauponibus

No. 683. 15 x 24 inches, 10 feet of cord and plug . . $10.00. Code Word — Cauponiser

No. 684. Same as 683 except switch to give three degrees of heat, $13.00. Code Word — Cauponized

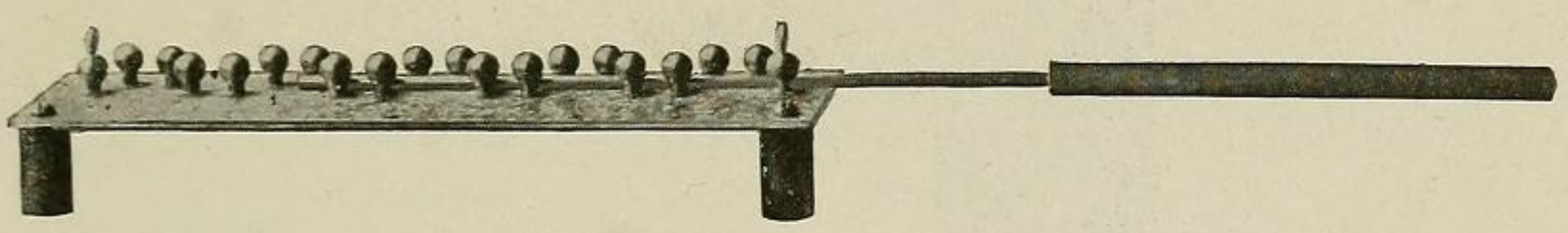
Block Tin for X-Ray Shields

This material is now much used, and is better by far than lead or rubber. It is light, does not tarnish, and is perfectly antiseptic.

Heavy weight . . .	$0.75 per lb.	Code Word — Blemish
Medium weight . . .	.25 per lb.	Code Word — Blemmyer

The latter is largely used for static work.

Multiple Spark Interrupter



The above cut shows a development of an old idea.

As is shown in the cut, this apparatus consists of a large number of small balls, mounted on an insulated block in such a manner that an arm can short circuit some or all of the balls, thus introducing the full resistance or any part of it into the tube circuit.

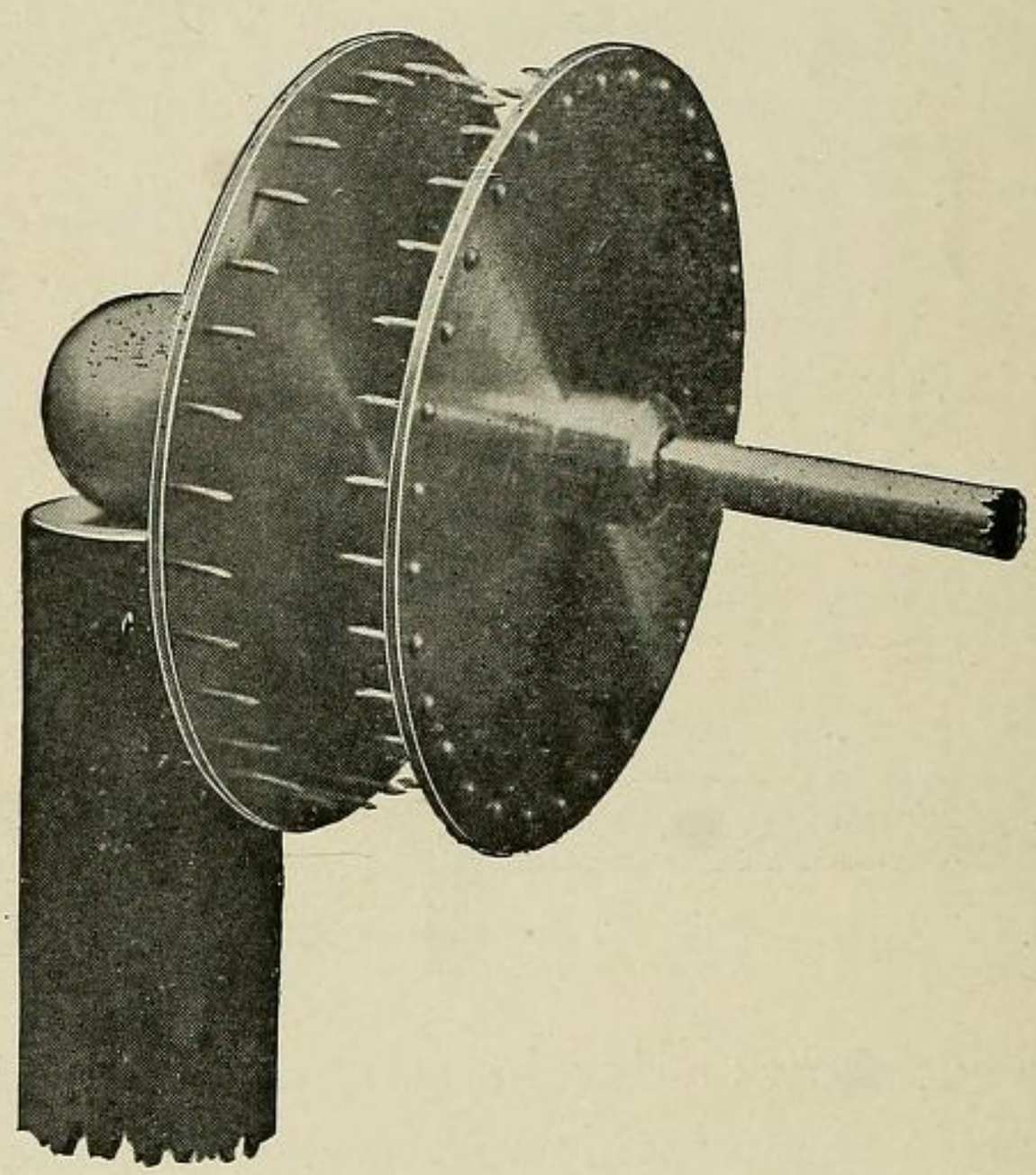
This interrupter is so arranged that it may be readily attached to the frame of the Static Machine or to any other convenient support, by means of two small screws. The interrupters may be used singly, or in pairs as may be desired.

This device is specially valuable in running X-ray tubes from Static Machines. By its use a very low or very high vacuum tube may be made to light up in a fine manner, and is under instant and complete control of the operator.

"A tube from which there is absolutely no fluorescence from a Static Machine when the interrupters are closed, will do valuable service when properly managed with the series ball interrupters, and be of service for a long time with little danger of being punctured — a matter of much importance to X-ray workers." — *Advanced Therapeutics.*

Price each, complete, with full working directions	$5.00.	Code Word — Clisobra

Spark Regulator for Coil



The cut shown above gives a good idea of this very useful attachment. It was designed specially for use with the Kinraide Coil, but may be used with any coil. Its special use is to introduce a resistance into the circuit with the patient or electrode, while using the high frequency electrodes. By its use, the current may be regulated with great exactness.

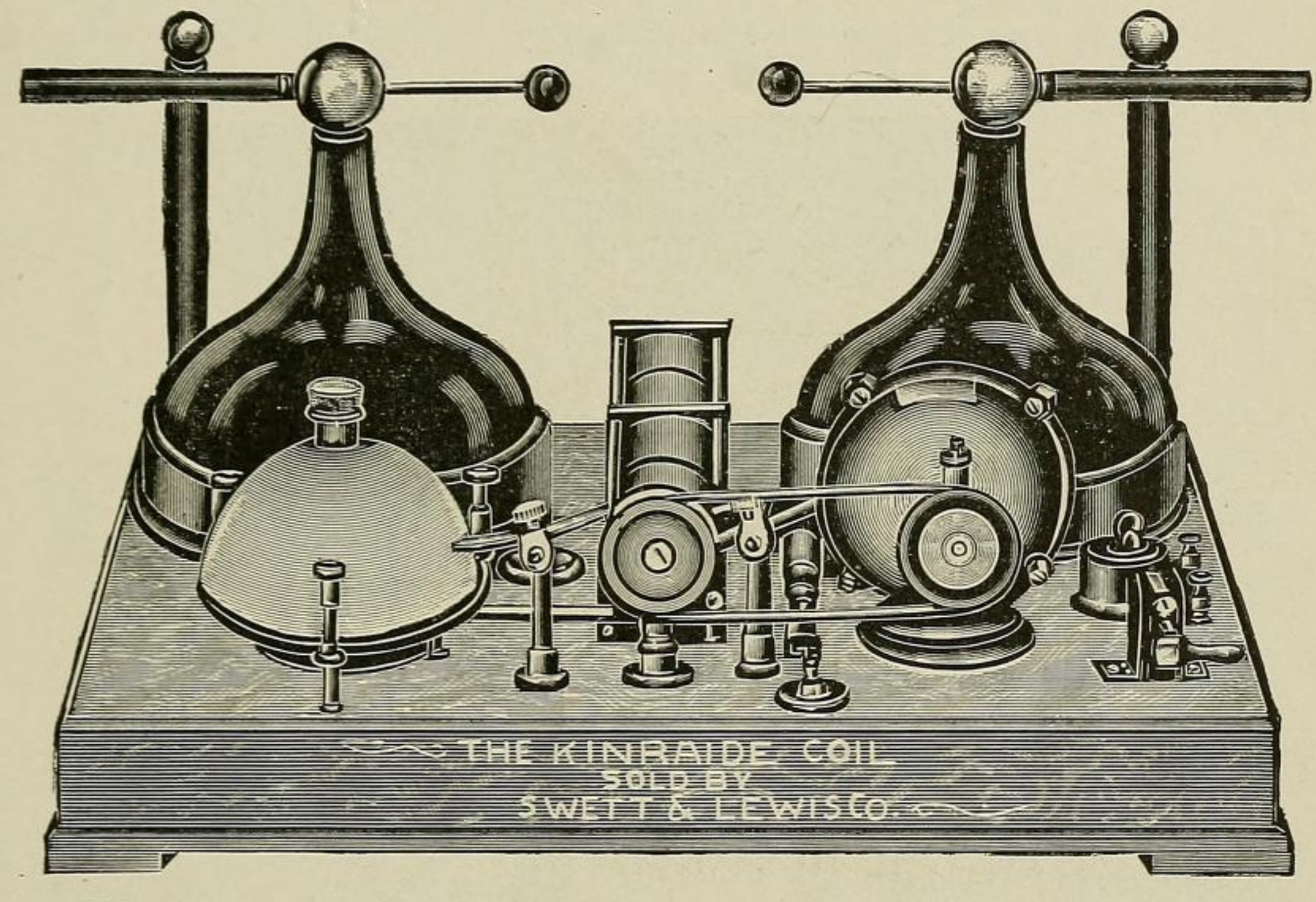
Price . . . . . $4.00 per pair. Code Word — Clisson

X-Ray Plates

5	x 7	$1.40 per dozen.	Code Word — Einhergang
6½	x 8½	2.30 per dozen.	Code Word — Einhuellen
8	x 10	3.40 per dozen.	Code Word — Einimpfen
10	x 12	5.50 per dozen.	Code Word — Einjæhrig
11	x 14	7.00 per dozen.	Code Word — Einjagen

A supply of the above sizes always in stock. These plates are specially wrapped in light proof paper, no plate holder being required for use with the X-ray.

The Kinraide Coil



We wish very briefly to call to your attention this superb piece of apparatus. This coil is light in weight, cannot be burned out or broken down, may be run on any light or power circuit whether direct or alternating, and is extremely powerful. For X-ray work, either Radiographic or Therapeutic use, it is unexcelled.

The coil generates a current of very high frequency, and the results obtained are unsurpassed.

Price of Coil $200.00

Send for Bulletins 28, 29 and 31 treating on this apparatus exclusively.

Outfit No. 31 Code Word — Unqueened

One direct current Kinraide Coil	$200.00
Two tubes, type K	30.00
One 5 x 7 platinum barium cyanide fluoroscope	12.50
One floor tube stand, with adjustable spark gap for controlling vacuum,	10.00
One rheostat	8.00
One set of electrodes and handle	8.00
	$268.50

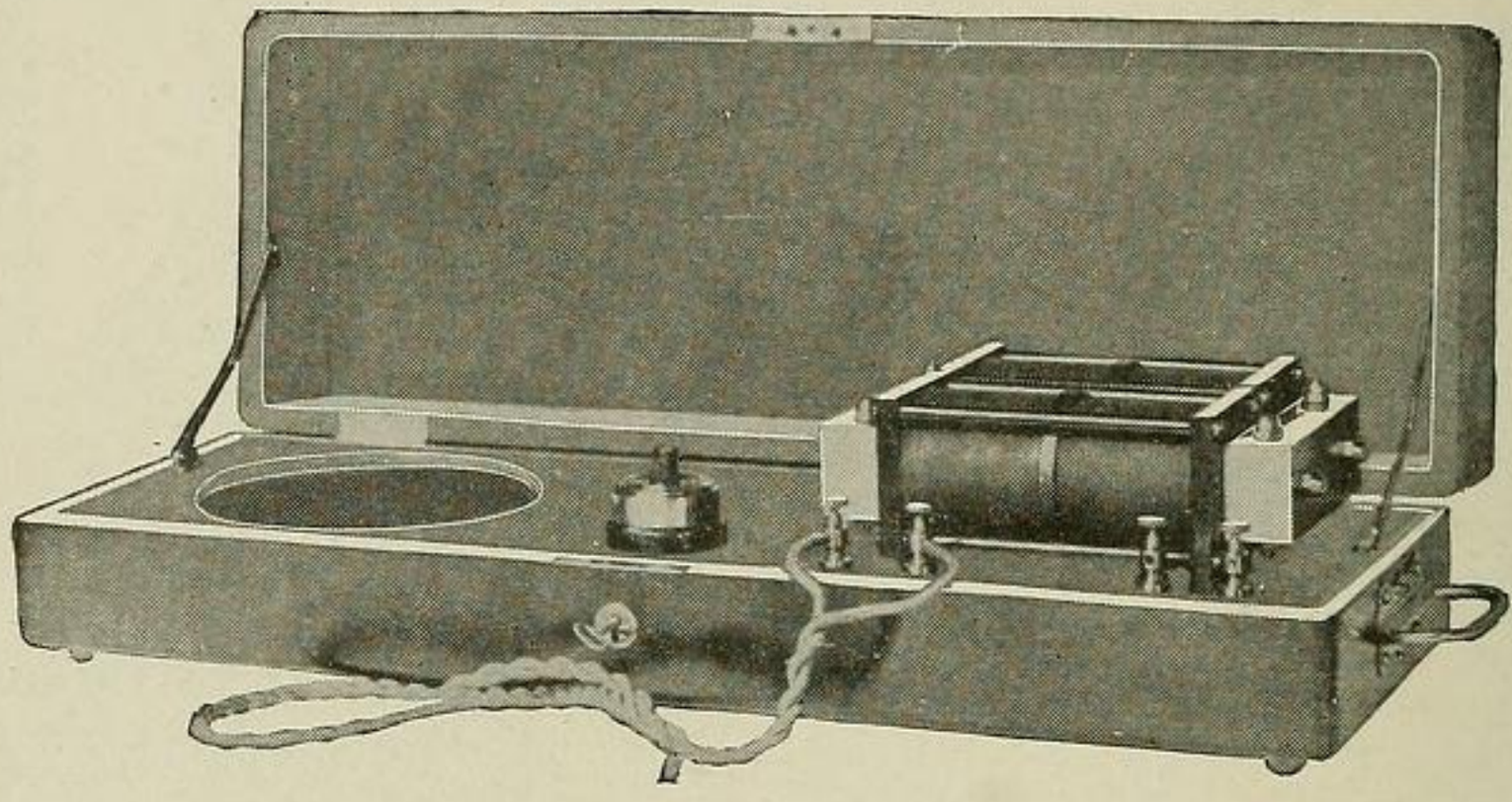
Outfit No. 32 Code Word — Troncs

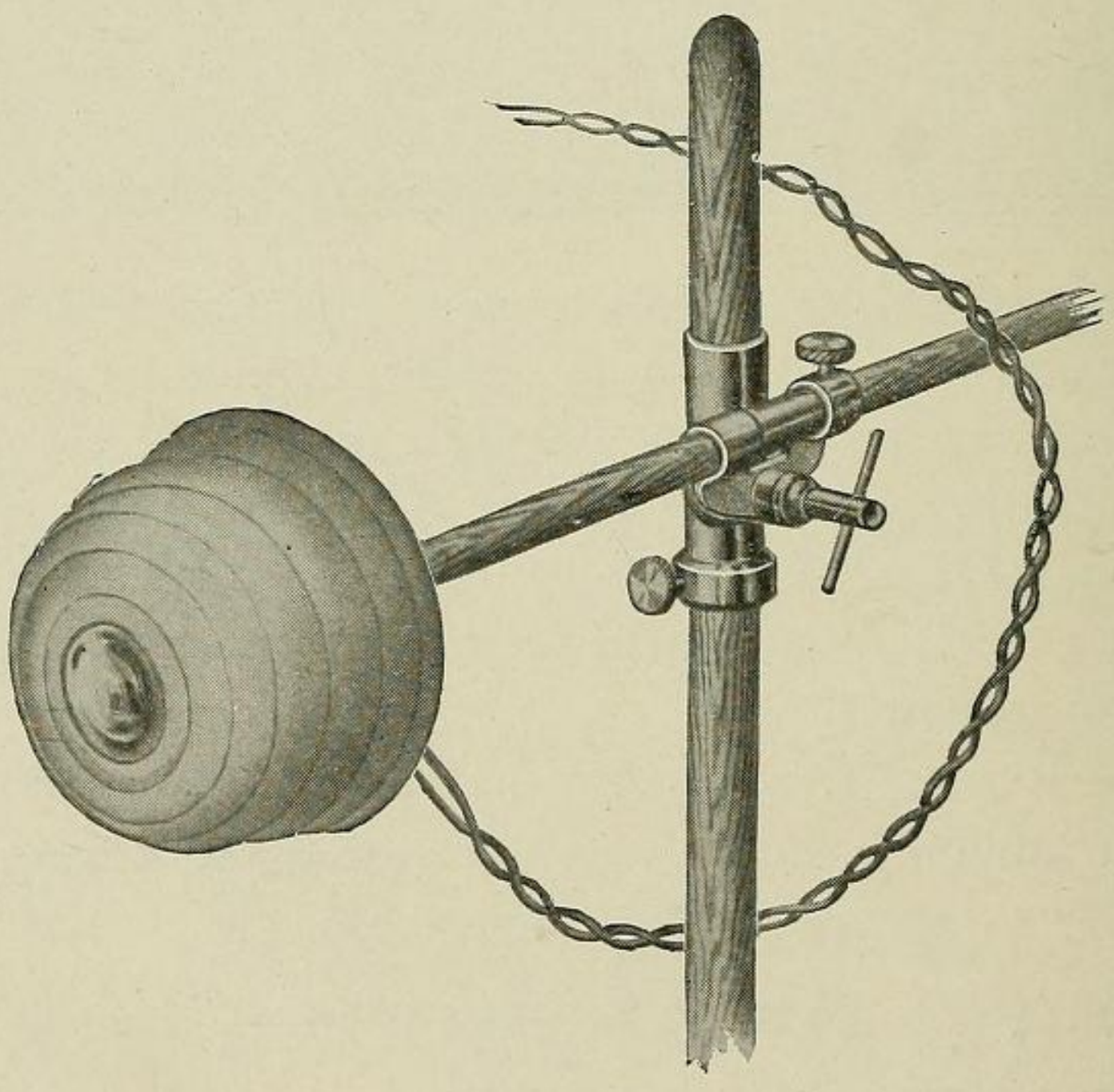
Same as above, except tubes for alternating current substituted for direct, $274.50

SWETT & LEWIS COMPANY

The Ultra

Patented





The cut gives a very good idea of this instrument. The box is nicely made of polished mahogany, mounted on four small rubber feet, and is fitted with a pair of stout handles and a good lock. The apparatus is designed to run from the alternating current and consumes but three amperes at 110 volts, which may be drawn from any lamp socket. The entire outfit, with exception of stand, may be

packed into the box, and is readily portable, extremely simple and very durable. The current, as it leaves the lamp, socket is transformed by the coils shown on right of cut, and the current from the transformer charges a condenser located in the base of the box. From the condenser, the current, as it goes to the lamp, is of the high tension, high frequency variety.

This is really a diminutive arc lamp, entirely enclosed in a nice nickel case, and having in front a fine rock crystal lens, which is perfectly transparent to the Ultra Violet ray. Instead of carbons, the electrodes of the lamp are of *iron*. They are regulated by a small thumb screw at the back of the lamp, and are very easily adjusted. The lamp runs very quietly; with the case removed a slight humming is heard. This lamp may be supported by any available stand. It is, however, designed with special reference to the floor stand illustrated on page 9 of this bulletin.

In connection with this stand, the lamp may be placed at any angle or height, and rotated in any direction with ease. The patient may be brought near to or touching the lens, so that the rays may be brought into direct contact with the desired area. Very little heat is generated and no cooling or coloring device is necessary. The whole case of the lamp may be readily detached and boiled for the purpose of sterilization if desired.

Few light rays are given off, but the arc is very rich in invisible Ultra Violet rays, so much so that *the eyes must be protected with glasses or some opaque substance at all times when near the lamp.* Tests show that this lamp produces many times the quantity of the true Ultra Violet rays generated by any other lamp on the market, not excepting the largest arcs in use. This, too, at very small expense.

The cost of running a lamp of this sort will not exceed six to eight cents per hour at the average cost of the electric light, while a large arc lamp may cost as much as two dollars for the same time, besides necessitating special wiring and fixtures.

Price complete, as shown in cut, with stand for supporting lamp, $110.00
Price without stand 100.00

Twelve extra electrodes and full instructions for use go with each lamp.

Lamps now built for alternating current only. In ordering, give voltage of circuit and number of alternations. Motor generator may be furnished to transform direct to alternating current. Price on application.

Complete Apparatus		Code Word With Stand	Code Word Without Stand
52 Volts	7,200 alternations	Retardaron	Retendamus
110 Volts	7,200 alternations	Retardatif	Retendreis
52 Volts	16,000 alternations	Retardavit	Retenez
110 Volts	16,000 alternations	Retardemos	Retengais
52 Volts	15,000 alternations	Retarding	Retenidas
110 Volts	15,000 alternations	Retardo	Retenons

We wish to dwell on the fact, that the entire working parts of the lamp are covered up, and the rays are thrown out in but one direction, so that neither the patient or operator are needlessly exposed.

In closing we wish to quote from a well-known authority on skin diseases :

"The cases of successful treatment of lupus,—and also, let me at once add here, of psoriasis and acne, — which are reported from all quarters, are most encouraging, and justify the expectation that treatment by 'iron' light, as applied to cutaneous diseases, may, before long, be accorded that foremost place in skin surgery, which it so amply deserves."

We should be glad to send the following bulletins to all interested. Preceding bulletins are out of date.

No. 28 Kinraide Coil and Accessories.
No. 29 "Why?" A list of testimonials.
No. 30 Directions for Operating Coil.
No. 31 List of Sample Coil Outfits.
No. 32 This one.
No. 33 Tubes for all Apparatus.
No. 34 Finsen and Violet Ray Apparatus.

This latter bulletin will be up-to-date and will include several new and improved pieces of apparatus. Be sure and get it before purchasing.

[N16]

MURRAY AND EMERY COMPANY, BOSTON

SEVENTH REVISED EDITION.

GREATLY ENLARGED.

Electro-Therapeutical Practice.

A Ready Reference Guide for Physicians in the Use of Electricity.

BY

C. S. NEISWANGER, Ph.G., M.D.

Graduate Medical School and Illinois Medical College; President and Professor of General Electro-Therapeutics, Illinois School of Electro-Therapeutics; Author of "Suggestions in Electro-Therapeutics;" Member A. M. A., Etc., Etc.

SWETT & LEWIS CO.

18 Boylston St., - BOSTON, MASS.

DR. NEISWANGER is, without doubt, the best known **CONSERVATIVE** writer and teacher of Electro-Therapeutics, and this work has done more to encourage a rational use of electricity in Medicine than all other efforts combined. It is written in his characteristic, plain and lucid style, and the handling of many of the more complex portions of the subject are a revelation to older students.

YOU CANNOT BE BUT PLEASED WITH IT.

PRICE, POSTPAID, $1.50.

NO BOOK upon a similar subject has so claimed the attention of the Medical Profession, and the ever increasing demand has induced the author to again re-write, enlarge and bring it up to date. Much new and valuable matter has been added, among which might be mentioned:

The Treatment of Varicocele; the Prostate Gland and Prostatic Urethra; Constipation; Practical Hints on Static Technique.

Electricity in Otology, embracing the Treatment of Auditory Canal; Diseases of the Middle Ear; Dilatation of the Eustachian Tube; Etc.

The Roentgen X-Ray Embracing its Physical Properties, Selection and Manipulation of Tubes, Proper Apparatus for its Generation, in which both the coil and Static Machine is considered; Technique of Application, Conservative Estimate of its Value in the Treatment of Malignant and Benign Growths, X-Ray Burns, General Conclusions, etc.

ELECTRO-THERAPEUTICAL PRACTICE.

ORDER BLANK.

----------*mo*----------*190*

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Enclosed find $1.50, *for which please forward me one copy of* ELECTRO-THERAPEUTICAL PRACTICE, *carriage prepaid.*

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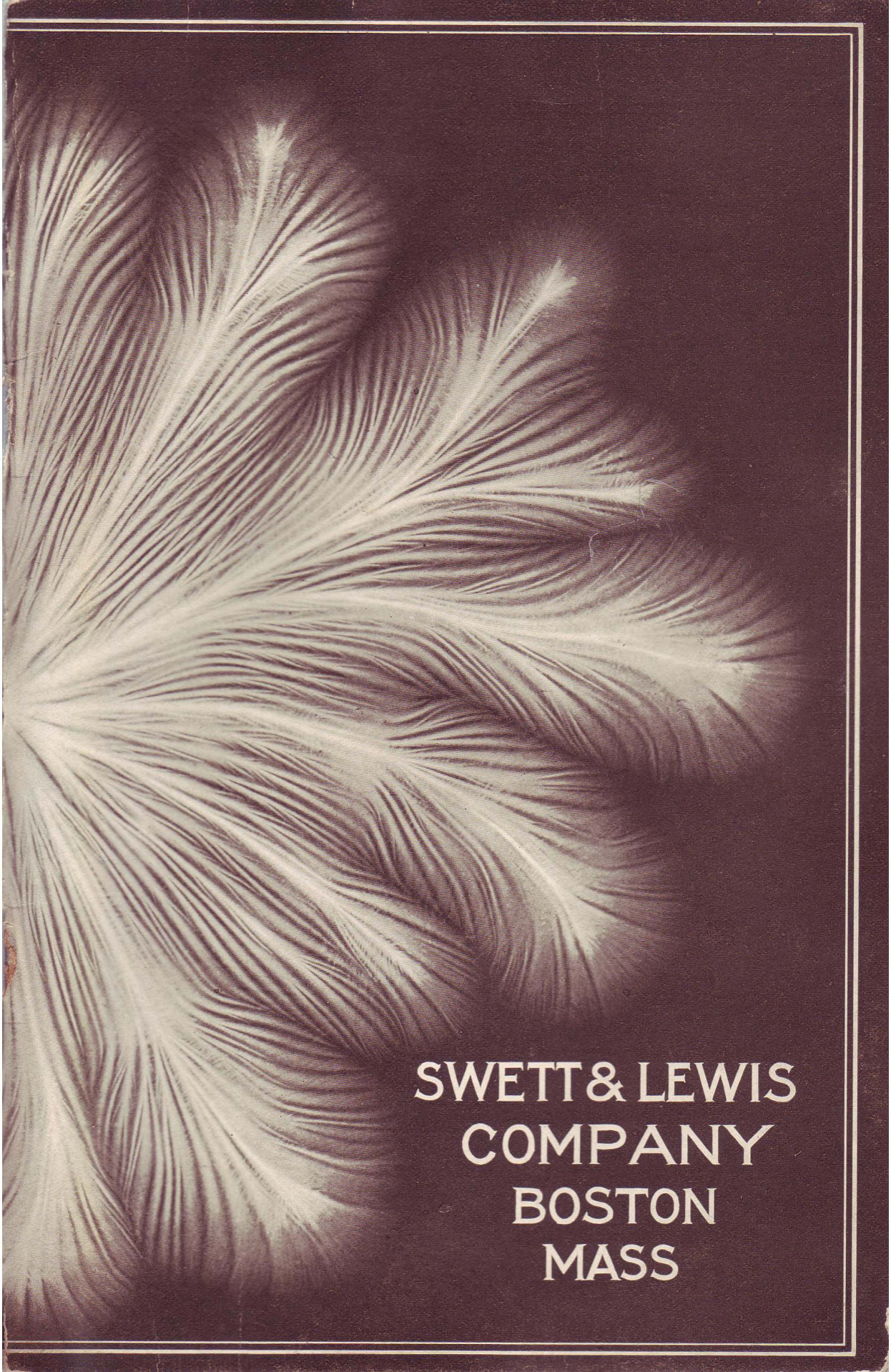


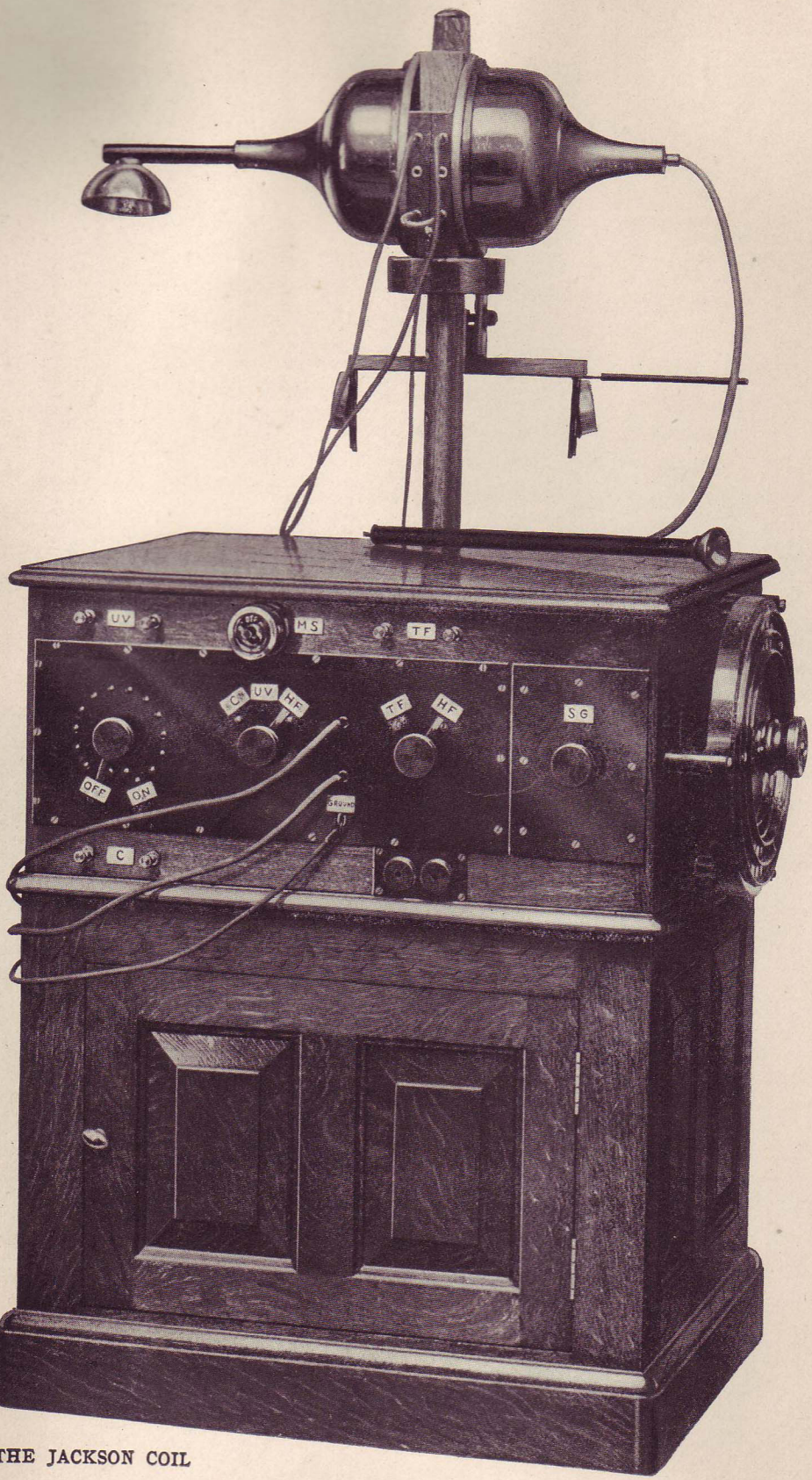
SWETT & LEWIS
COMPANY
BOSTON
MASS

The Jackson High Frequency Coil

BULLETIN
THIRTY-FIVE

Swett and Lewis
Company
18 Boylston Street
Boston

¶ WE HOPE THAT THE UNIQUE DESIGNS ON BOTH THE ENVELOPE AND COVER OF THIS BULLETIN WILL CAUSE THE OBSERVER TO INVESTIGATE THE COIL WHOSE AUTOGRAPH IS SHOWN. THESE PICTURES WERE MADE BY THE DISCHARGE FROM THE COIL COMING IN CONTACT WITH A PHOTOGRAPHIC PLATE, AND SHOW THE WIDE RANGE OF THE COIL TO WHICH WE CALL YOUR ATTENTION IN THESE PAGES



THE JACKSON COIL

BULLETIN THIRTY-FIVE

The Jackson Coil

TO meet the demand for a High Frequency Coil from which the breeze current, similar to that from a Static, can be obtained, this Coil has been devised. It is the result of several years' experimental work on the part of the inventors, Messrs. Kinraide and Jackson, and is a development of the well-known Kinraide Coil, and much superior to it.

¶ The Jackson Coil has no moving parts and the primary current is not interrupted. The fact of not having to deal with a complicated, dirty interrupter that always needs tinkering and petting will be appreciated by the busy physician. No interrupter has yet been made that will successfully handle currents of voltages commonly used in lighting service, without annoyance. Some possess one bad feature and some another, but those who have used several interrupters will agree that there are serious drawbacks to every one, and the expense of maintenance is not to be disregarded. It is a disagreeable task to clean an interrupter using mercury or acid, and even the replacing of platinum points is a serious expense. In this Coil there is nothing to wear out or over-heat, and when adjusted to give a certain current it will run for hours without any variation or attention whatever. As shown in the illustration, the apparatus is enclosed in a very handsome quartered oak cabinet resting on the floor, finished on all four sides, which makes it an ornament to any office. The top of the cabinet is perfectly plain. The switches and regulating devices are placed where they will be readily accessible, and everything is so constructed that no metal parts whatever project from the cabinet, making it impossible to receive an accidental shock. There is no delicate mechanism exposed. The Coil can easily be kept in the very best shape with a minimum amount of labor. All

"You certainly have gotten several laps ahead of every other maker of coils in your new spark gap, which does work beautifully."

the working parts of the coil proper are in the upper part of the cabinet, the top of which can readily be removed.

¶ The Coil is designed to run on an alternating circuit, and when a direct current only is available, a rotary converter is placed in the base of the cabinet and controlled from the outside. The converter is of the best design, of ample proportions, and capable of running for hours without attention, so that the apparatus is equally efficient on either circuit. When the Coil is run on the alternating service, the lower part of the cabinet is not needed, and may be used for the storage of tubes and other paraphernalia. If the direct current should be given in the daytime and alternating at night, or vice versa, a small switch would enable the Coil to be run at all times.

¶ A new feature of this Coil is the spark gap, which is the fundamental part of every high frequency or oscillating system. This has been developed on an entirely new plan and does not need any attention whatever. It is entirely out of sight and does not annoy the operator by light or noise, as in some forms of apparatus. It is placed in a small drawer or slide, so that it is instantly accessible, and cannot be replaced in any but the right way. It is the result of patient research and countless experiments, that were discontinued only after it was deemed certain that no further improvement could possibly be made. It is easily adjustable and the sparks flow across with absolute steadiness in any position. An entirely new method of cooling the electrodes is used, which is perfect in its action and requires no water or other outside aid. The sparking takes place between two prisms of ample length, which will last during months of continuous hard work. Each prism has four edges which may be used, and it is but the work of a moment to change them or put in new ones, which cost but little.

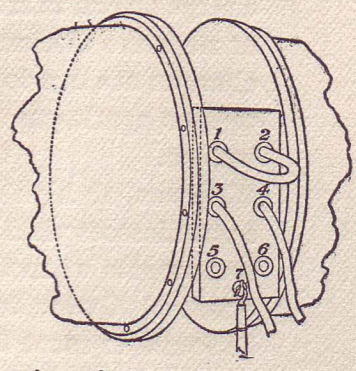
"The regulation for both X-Ray and high frequency is perfect."

¶ The transformer used is of ample size to deliver a large current at a very high voltage, and is capable of standing the entire current direct from the street. A rheostat is used for purposes of regulation only. The condenser is simple, reliable, and will give no trouble.

¶ In view of the fact that currents of extreme high frequency and voltage cannot be transmitted through even a heavily insulated

conductor for a few feet without great loss, it has been deemed advisable to bring the final transformer, in the form of a pair of secondaries, close to the patient, instead of attempting to bring the patient up to the cabinet. These secondaries are mounted upon an attractive floor stand so that they may be readily adjusted at any convenient height, and are connected by means of a flexible cable to the cabinet. In the illustration of the Coil, this stand is shown directly behind the cabinet. The base is large and heavy enough to preclude the possibility of being over-balanced. By this arrangement, a very high frequency current of great volume may be delivered to the person of the patient with small loss. The current required to excite these secondaries is of such a character as to flow readily through a cable of moderate length, which can be handled with perfect safety, even when delivering the full output. A unique tube holder, capable of every adjustment, may be attached to the secondary stand at will, making an unexcelled device for X-Ray work. The tube holder may, when not in use, be turned down out of the way, as shown in the cut.

¶ The secondaries proper are of the same design as those in the Kinraide Coil, a thin disc of fine wire embedded in an insulating compound and placed inside of a protecting case. This arrangement, with a ground wire, gives perfect protection from a breakdown or an accident. The full discharge can be grounded with no strain on the insulation, and the ground between the two secondaries does not diminish or interfere with the application of both secondaries to the patient. The multiple primaries in each of the secondaries are a new feature. These primaries are so arranged that, by means of a very simple switching device, three different combinations of primary are obtained as applied to each secondary coil, so that either secondary may be used independently or both together with any combination; thus giving a variety of effects with one instrument — never before approached — combined with the utmost simplicity. The current of the highest

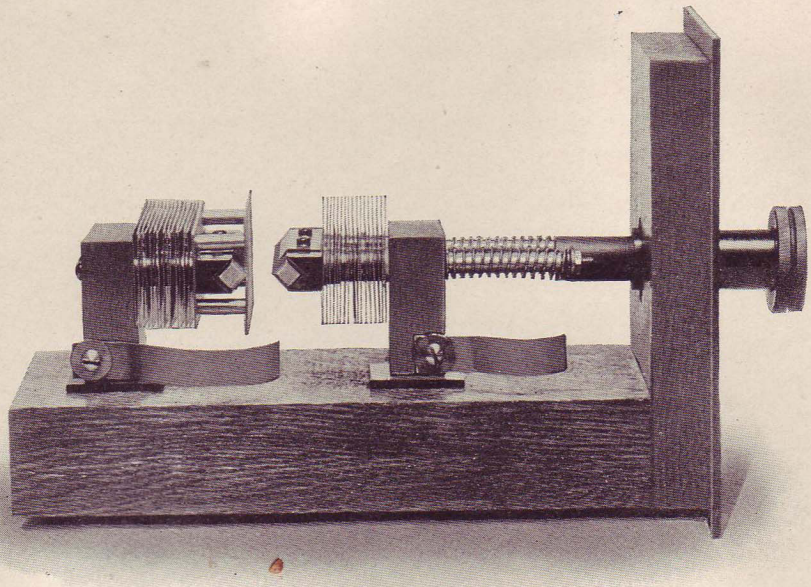


frequency is obtained from the primary of the fewest turns, combined with the shortest length of the spark gap. All of these combinations can be varied at will by means of a rheostat of fifty steps and the latest pattern, so that infinite delicacy of adjustment may be obtained. The current consumption of the Coil is small. Unlike most pieces of apparatus which take but a small amount of current to excite, the quantity of high frequency current generated is large, and the apparatus is of a high degree of efficiency.

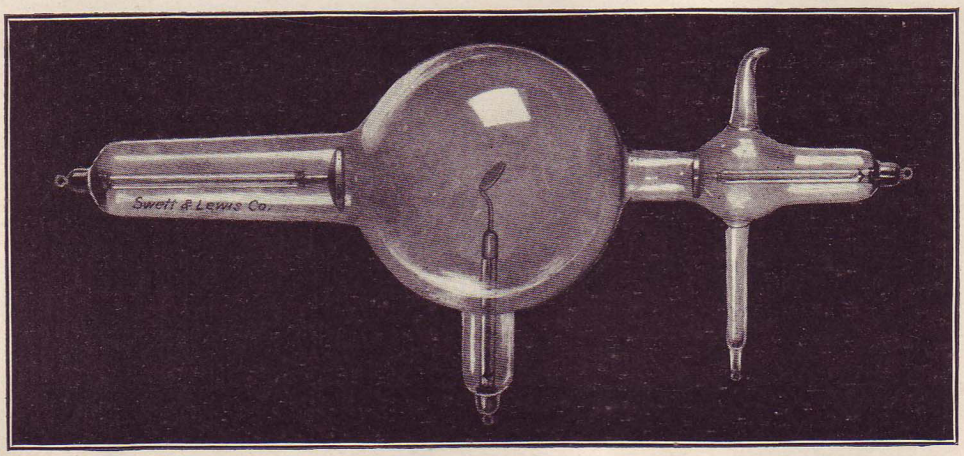
¶ This Coil may be so manipulated as to produce a surprising variety in the discharge. A soft blue breeze can be obtained of long, feathery, fern-like, positive discharge, which will be given off in every direction. These are soft and attractive in appearance. Fierce spark rays may be generated, interspersed with pink, snaky flames. At times, the discharge from the secondary may be entirely positive and can be readily recognized. At other times, a purely negative discharge is given from the ball, each point of discharge being surmounted by a positive discharge drawn in from the surrounding air. The effects of positive or negative discharge produce quite a different sensation. These changes are due to the various frequencies readily obtained by the unique spark gap and possible with no other type of apparatus known.

¶ Users of high frequency apparatus have demonstrated that some diseases yield more readily to currents of low frequency, some to currents of moderate, and still others to extremely high frequency. Owing to the great flexibility of this apparatus, it will be found to meet the requirements of all. The application of the current by means of vacuum electrodes is extremely easy, and the same effect can always be repeated by the same adjustments. New designs in metallic electrodes have been devised, which will give a splendid high frequency spray or spark at the end of a flexible cable. The brush discharge from the crown electrode is long and of the utmost fineness and smoothness, and of such a character that great latitude can be allowed in the treatment without accidentally sparking the patient. This point alone is of great value.

"The volume of current delivered is wonderful."



THE SPARK GAP



SPECIAL H. F. X-RAY TUBE

¶ The whole effort of the designers of this Coil has been to produce an easily manipulated apparatus, giving a wide range of effects, any one of which can be repeated at any time by the same adjustments, which are easily comprehended and remembered. Although the appearance of the cabinet is simple and convenient, yet the amount and variety of hard work that can be obtained from it at any time will put far in the background the most powerful Static machine, the large Rhumkorff Coil with its cumbersome high frequency attachment, and any Ultra Violet apparatus on the market, to say nothing of the cautery.

¶ We do not believe it is possible by any other means of construction to produce a Coil capable of giving such enormous voltages and frequencies without quickly destroying itself. The Coil has been given the most exhaustive and thorough tests, and has met every requirement imposed upon it by the most exacting.

Thermo = Faradic

¶ A unique feature, which we believe is found in this Coil only, is a Thermo-Faradic attachment; which, briefly stated, is a derived circuit from a closed coil of a certain proportion. The current is applied to the patient by means of either the well-known sponge electrodes or metallic handles, and can be widely varied by means of the spark gap and rheostat from a current markedly faradic in its characteristics and possessing great smoothness, to a current having no faradic effects and producing within the body a sensation of great heat; and that this is real heat locally generated is demonstrated by actual heating of the sponges, and by the sensations of the patient. If the metal electrodes from this circuit are brought in close proximity to each other, a small but brilliant arc is produced of such intense heat that actual welding of copper (on a small scale) may be made possible. If two strips of metal are attached to this Coil and are placed in a little water, it will soon become very hot. By placing both of the electrodes on or near the diseased area, the effect will be strictly local; or by separation,

"I am using the Thermo Faradic currents with good results in cases of neuralgia."

widely diffused. Sufficient current may be taken in this manner without discomfort to bring to full brilliancy a sixteen candle power lamp, when placed in the same circuit with the patient. These currents are of true high frequency, oscillating millions of times per second.

Ultra Violet Effects

¶ Owing to the peculiar construction of the Coil, it is possible to produce powerful Ultra Violet effects. To do this, a special switch is put on the front of the cabinet, together with a pair of binding posts, and a lamp similar to the one furnished with the alternating current Kinraide Coil or the "Ultra" may be attached. This is an iron condenser arc and is fully described on pages 26, 27 and 28 of Bulletin 33. Ultra Violet rays are generated in great profusion, almost to the exclusion of all light rays. The lamp should be used in connection with a quartz compressor. For prices, see page 10.

Cautery Effects

¶ A powerful cautery transformer may be incorporated in the cabinet at a slight additional cost. The transformer gives a very large quantity of current at so low a voltage that diagnostic lamps or cautery knives may be used with perfect safety. The control is perfect and the graduations are fine. This transformer is entirely separate from and has no connection with the high frequency Coil, and there is absolutely no chance of getting a high voltage through it.

"The Static spray not affected by dampness is what we have been looking for."

X-Ray Tubes

¶ This tube was designed specially for this Coil, and is a modification of the old Type H, used with the Kinraide Coil, and combined with the valve tube so called. The reversed waves are choked

back so that the hemispherical effect so familiar to Static users is produced. This tube should be a general favorite, as it is capable of very hard usage. It is recommended for all coils giving an alternating current. The tube is strongly built, the bulb of good size, and the terminals are well supported, so that they will not break down either in use or during transportation.

¶ We have no hesitation in saying that there is no apparatus more flexible or under more perfect control for operating an X-Ray tube, or for high frequency work. A Geissler tube can be excited so that it will glow to any degree of brilliancy, and this light will remain absolutely steady as long as required The Coil will deliver such an amount of current as to be beyond the capacity of most X-Ray tubes, or so little that the smallest tube can be made to barely glow. In X-Ray practice, by means of the spark gap alone, the bones of the hand may be seen as almost transparent, or the whole hand itself may be made black, and this without change of vacuum in the tube.

¶ CODE WORDS

52 volts, 7,200 Alternations	Koperig
104 volts, 7,200 Alternations	Kopernikus
110 volts, 7,200 Alternations	Koperkies
52 volts, 16,000 Alternations	Koperkleur
110 volts, 16,000 Alternations	Kopermolen
110 volts, 15,000 Alternations	Kopermunt
110 volts, Direct Current	Intardatum
220 volts, Direct Current	Intardetis
235 volts, Direct Current	Intarlando
250 volts, Direct Current	Intarlare
500 volts, Direct Current	Intarlato

"My last spark gap was always out of order. Have had no trouble with your pattern."

Guarantee

¶ With each Coil furnished, a guarantee will be given against any defect in workmanship or material, or against burn-out not caused by improper usage, for one year from date of shipment.

Price List

JACKSON HIGH FREQUENCY COIL, to run on any alternating current from 52 to 250 volts and any commercial cycle, complete as shown in cut, opposite page 2, including electrodes, stand and tube holder. Price, $350.00
Code word, Heidengeld.

JACKSON HIGH FREQUENCY COIL for 110 volts direct current, as above, including motor generator . . . . . Price, $420.00
Code word, Headledge.

JACKSON HIGH FREQUENCY COIL for 220 volts direct current, as above, including motor generator . . . . . Price, $430.00
Code word, Heenkomen.

MOTOR GENERATOR including starting box, for 110 volts direct current, when sold without coil . . . . . Price, $70.00
Code word, Hervatting.

MOTOR GENERATOR including starting box, for 220 volts direct current, when sold without coil . . . . . Price, $80.00
Code word, Hervimos.

MOTOR GENERATOR including starting box, for 500 volts direct current, when sold without coil . . . . . Price on application
Code word, Hervento.

CAUTERY TRANSFORMER, additional . . . . . Price, $25.00
Code word, Curtelasse.

CAUTERY HANDLE with snare . . . . . Price, $6.00
Code word, Curtem.

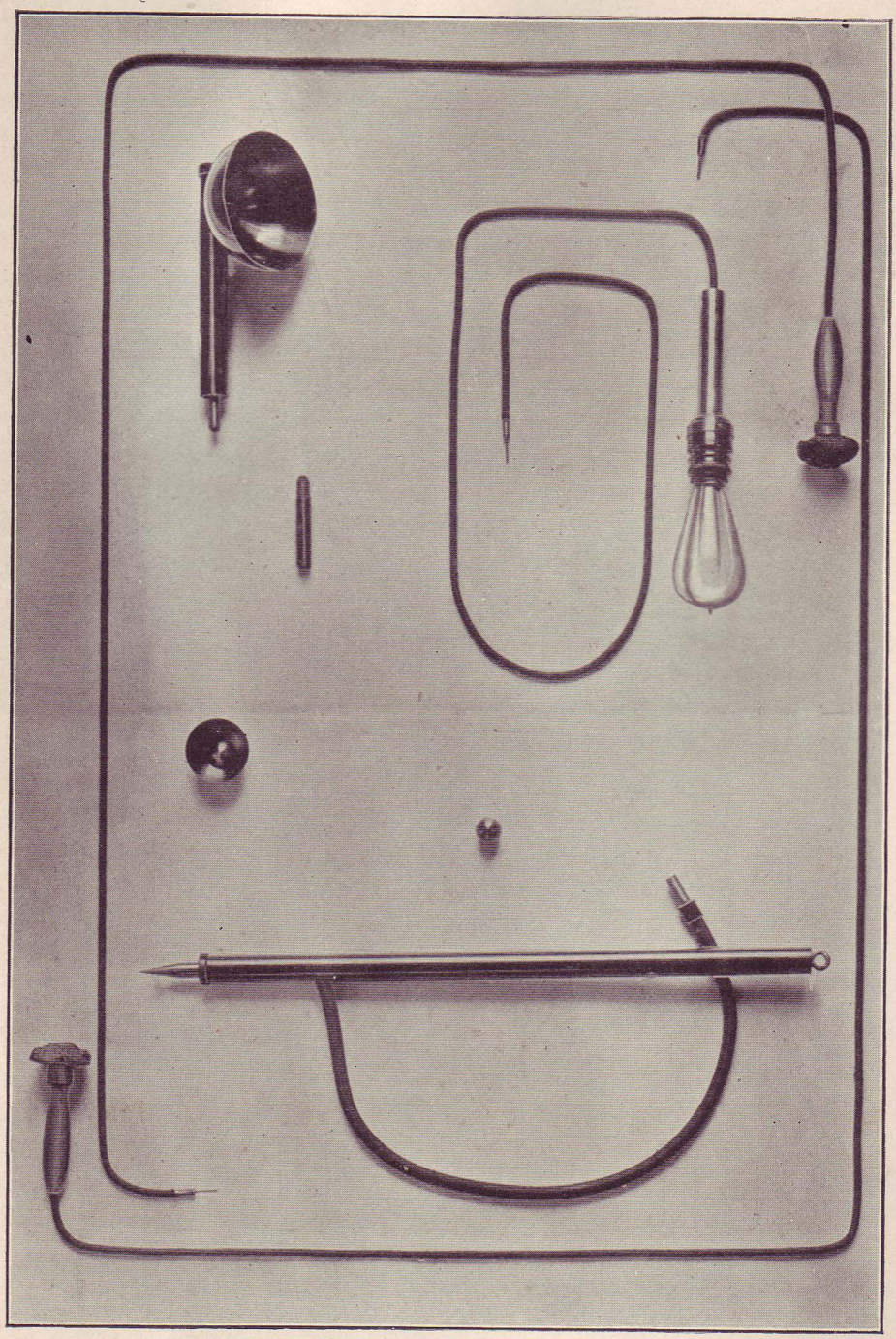
CAUTERY HANDLE, plain . . . . . Price, $1.50
Code word, Curtiamos.

"This spark gap does NOT keep getting out of order as my last one."

CAUTERY CORDS, per pair . . . . . Price, $1.50
Code word, Curtidos.

CAUTERY KNIVES, No. 1 to No. 8 . . . . . Price, each $0.75
See illustration opposite page 15.
Code word for set of eight, Curtilage.

ULTRA VIOLET ATTACHMENT, including lamp, cable and arm for tube stand . . . . . Price, $60.00
Code word, Conjunctum.



ELECTRODES

COMPRESSOR with fine quartz lens . . . . . Price, $5.00
Code word, Condate.

SET OF METALLIC HIGH FREQUENCY ELECTRODES, when sold separately . . . . . Price, $10.00
Code word, Hervencia.

SET OF SIX GLASS VACUUM ELECTRODES with handle, Price, $5.00
Code word, Koukarien.

SPECIAL H. F. X-RAY TUBE, as shown opposite page 6. Price, $14.00
Code word, Depor.

MINERAL TUBES, to be used as electrodes, 20 inches long, very brilliant.
Code word, Denuam. Price, each $3.00

GEISSLER ELECTRODES, No. 17 and No. 18 filled with liquid, very highly colored. Price, each $2.00. Special set of six assorted colors, Price, $10.00
Code word, No. 17, Kourgan; No. 18, Kourilien; set of six, Kozel.

WILLEMITE TUBE, small X-Ray tube with piece of willemite for anode, very handsome and brilliant . . . . . Price, $6.00
Code word, Demptos.

BLOCK TIN for X-Ray shields, per pound, $0.25. A strip thirty-six inches long by fifteen inches wide makes a pound.
Code word, Blemmyer.

List of Outfits

OUTFIT NO. 60. For the alternating current.
Code word, Handlohn.

One Jackson Coil, complete, including set of metallic electrodes and tube stand	$ 350.00
One H. F. X-Ray Tube	14.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of Vacuum Electrodes with Handle	5.00
	$379.00

"Your spark gap is the right principle and does not require continual repairs."

OUTFIT NO. 61. For the 110 volts direct current.
Code word, Handlubben.

Same as enumerated in Outfit No. 60	$379.00
One Motor Generator, complete, fitted in cabinet	70.00
For 220 volts, add to above, $10.00.	$449.00

OUTFIT NO. 62. For the alternating current.
Code word, Handlung.

One Jackson Coil, complete, including set of metallic electrodes and tube stand	$350.00
Two H. F. X-Ray Tubes	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of Vacuum Electrodes with Handle	5.00
One No. 17 and one No. 18 Electrode	4.00
Four pounds Block Tin	1.00
	$398.00

OUTFIT NO. 63. For the 110 volts direct current.
Code word, Handmagd.

Same as enumerated in Outfit No. 62	$398.00
Motor Generator complete and fitted in cabinet	70.00
For 220 volts, add to above, $10.00.	$468.00

OUTFIT NO. 64. For the alternating current.
Code word, Handmaiden.

One Jackson Coil, complete, including set of metallic electrodes and tube stand	$350.00
Two H. F. X-Ray Tubes	28.00
One 6 x 8 Platinum Barium Cyanide Fluoroscope	16.00
One set of Vacuum Electrodes with Handle	5.00
One set of six No. 17 and No. 18 Electrodes	10.00
One roll of Block Tin, 10 pounds	2.50
Two Mineral Tubes	6.00
One Willemite Tube	5.00
	$422.50

"I am delighted with my new coil. Enclosed please find check."

OUTFIT NO. 65. For the 110 volts direct current.
Code word, Handmandel.

Same as enumerated in Outfit No. 64	$422.50
Motor Generator complete and fitted in cabinet	70.00
For 220 volts, add to above, $10.00.	$492.50

OUTFIT NO. 66. For the alternating current.
Code word, Handmesser.

One Jackson Coil, complete, including set of metallic electrodes and tube stand	$350.00
Two H. F. X-Ray Tubes	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of Vacuum Electrodes with Handle	5.00
One set of six No. 17 and No. 18 Electrodes	10.00
One roll of Block Tin, 10 pounds	2.50
Two Mineral Tubes	6.00
One Willemite Tube	6.00
Cautery Attachment	25.00
One Handle and Snare	6.00
Eight Cautery Knives	6.00
Ultra Violet Attachment	60.00
One Quartz Compressor	5.00
	$519.50

OUTFIT NO. 67. For the direct current.
Code word, Handmolen.

Same as enumerated in Outfit No. 66	$519.50
One Motor Generator complete fitted in cabinet	70.00
For 220 volts, add to above, $10.00.	$589.50

¶ If the Ultra Violet Attachment is desired in addition to any of the above outfits, except No. 66 and No. 67, where it is included, add $60.00, and for Cautery Transformer add $25.00, also price of handle, knives and cords as desired. See page 10.

¶ The above outfits are given as samples only, and may be changed to suit the convenience of the purchaser.

¶ In ordering, use outfit number or code word. Be sure to specify the current on which the coil is to be used, and if alternating current, the number of alternations as well as the voltage. For list of code words for the various currents, see page 9. Example: if you wish to order outfit No. 62, coil to be used on a current of 104 volts, 7200 alternations, to be shipped by express, wire as follows:—Express Handlung Kopernikus.

"The Jackson Coil is a superb piece of apparatus and I am delighted with it."

Terms

¶ Prices in this bulletin are net, except where cash accompanies order, in which case a discount of 5 per cent will be allowed.

¶ In case of C. O. D. shipments, where a draft of 25 per cent of bill accompanies order, the same discount may be taken.

¶ Remit by express or post-office money order or by New York draft. Add twenty-five cents to face of all checks, except on New York or Boston, to cover collection charges.

References

¶ Customers unknown to us must give satisfactory references, send draft with order, or we will ship C. O. D., charges for return of money to be borne by purchaser.

¶ Goods will be delivered f. o. b. freight or express, Boston, Mass. No charge for packing. Each piece of apparatus is carefully packed and no allowance will be made for loss or breakage in transit.

¶ Western Union Telegraph code used. Telegraph and cable address, "Swettxray."

¶ When in Boston, we shall be glad to have you make your headquarters at our office.

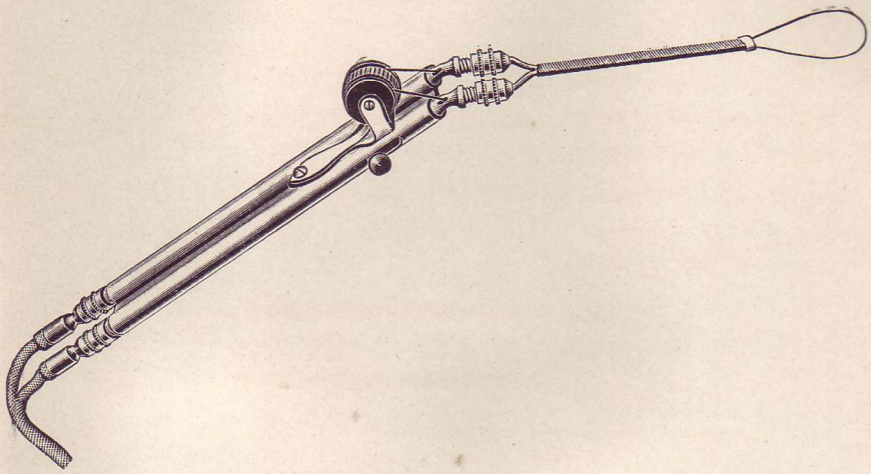
Bulletins

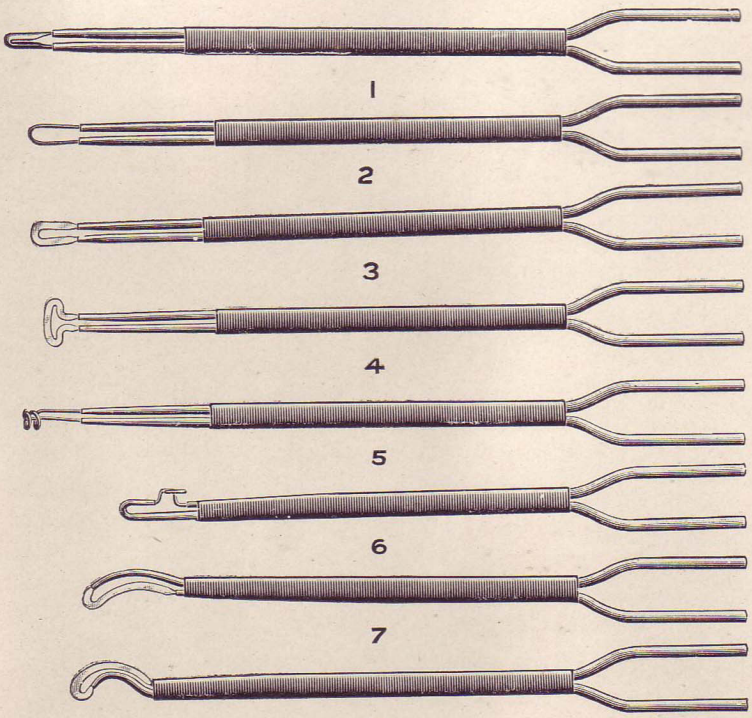
¶ We should be glad to send the following bulletins to all interested. Other bulletins are out of date.

Number Twenty-eight, Kinraide Coil and Accessories
Number Thirty, Directions for Operating Kinraide Coil
Number Thirty-two, Electrical Novelties
Number Thirty-three, Coils and X-Ray Tubes
Number Thirty-five, this one

"I consider the new Jackson Coil the most complete and satisfactory."

¶ For a good, powerful, thoroughly reliable, as well as a cheap X-Ray Coil, we heartily recommend the Kinraide for your consideration. Bulletin 33 illustrates and describes this coil as well as X-Ray tubes and supplies in general, and will be sent on request.





CAUTERY KNIVES

The Kinraide Coil

¶ For those who do not wish to invest much money but yet want a good, strong, serviceable and durable coil which will do good X-Ray work, this Coil is recommended. It delivers a high frequency current that may be used to good advantage by means of the vacuum electrodes.

¶ It may be furnished plain or with the ultra violet attachment as desired. This attachment can be used only with the alternating current coils.

¶ For full particulars concerning this Coil, see Bulletin 33.

OUTFIT NO. 52. For direct current.
Code word, Epidrome.

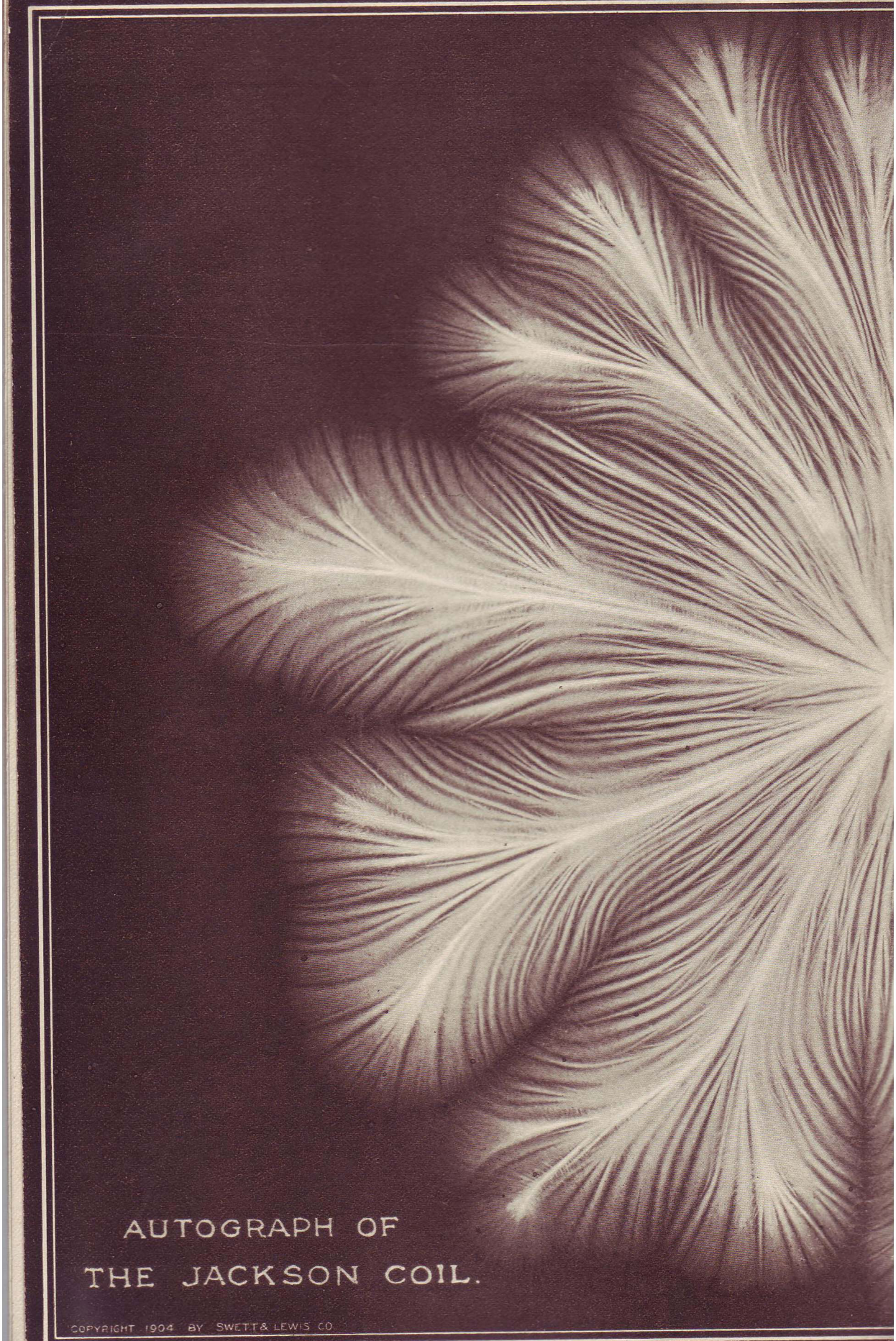
One direct current Kinraide Coil	$130.00
Two Tubes, Type K	24.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One Rheostat	8.00
One Floor Tube Stand	10.00
Four pounds of Block Tin	1.00
One pair of Spark Regulators	4.00
One set of six Vacuum Electrodes	5.00
	$192.00

OUTFIT NO. 53. For alternating current.
Code word, Epieront.

One alternating current Kinraide Coil	$130.00
Two Tubes, Type H	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One Rheostat	8.00
One Floor Tube Stand	10.00
Four pounds of Block Tin	1.00
One pair of Spark Regulators	4.00
One set of six Vacuum Electrodes	5.00
	$196.00

"My new coil is working beautifully. The effect of the spark is equal to that of a Static."

Press of Murray and
Emery Company, Boston



AUTOGRAPH OF
THE JACKSON COIL.

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SWETT & LEWIS
COMPANY
BOSTON
MASS

Bulletin
Thirty-seven

SWETT AND LEWIS
COMPANY

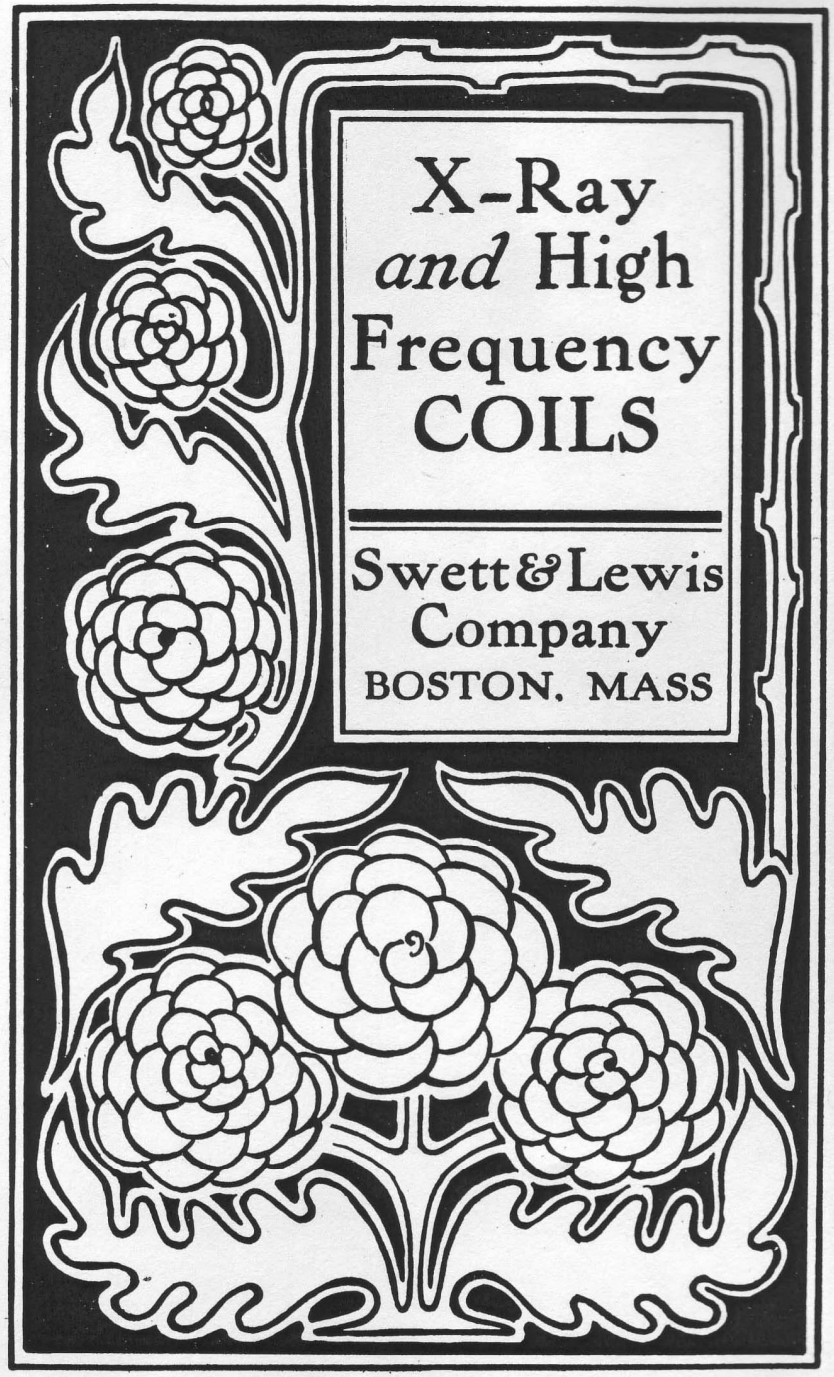
High Frequency Coils

18 BOYLSTON STREET
BOSTON

SL

Bulletin Thirty-seven

$150


X-Ray
and High
Frequency
COILS
Swett & Lewis
Company
BOSTON. MASS

The Choice of a Coil

WE REALIZE that many of our customers live at too great a distance to investigate personally the merits of each coil shown here and this is our apology for these few words. We will endeavor to give briefly the relative merits of the various coils listed herewith.

The JACKSON COIL

This is designed to take the place of a static machine, and to give the breeze discharge or effleuve with the various high frequency discharges, also X-Ray work that will be at least equal to that from a static.

The CYCLONE CABINET COIL *and* DESK COIL

These coils are designed to do heavy X-Ray work, thermo-faradic and vacuum electrode work with a minimum amount of attention. The crown breeze cannot be obtained.

The CYCLONE PORTABLE COIL

This coil was designed for bedside work and has the same power as the other two styles, with the added advantage of being portable and extremely simple.

The KINRAIDE COIL

Has been on the market so long and is so well known that it does not require further explanation than that given on pages 26 and 27.

The MILLIAMPEREMETER

Shown on page 33, should not be overlooked.

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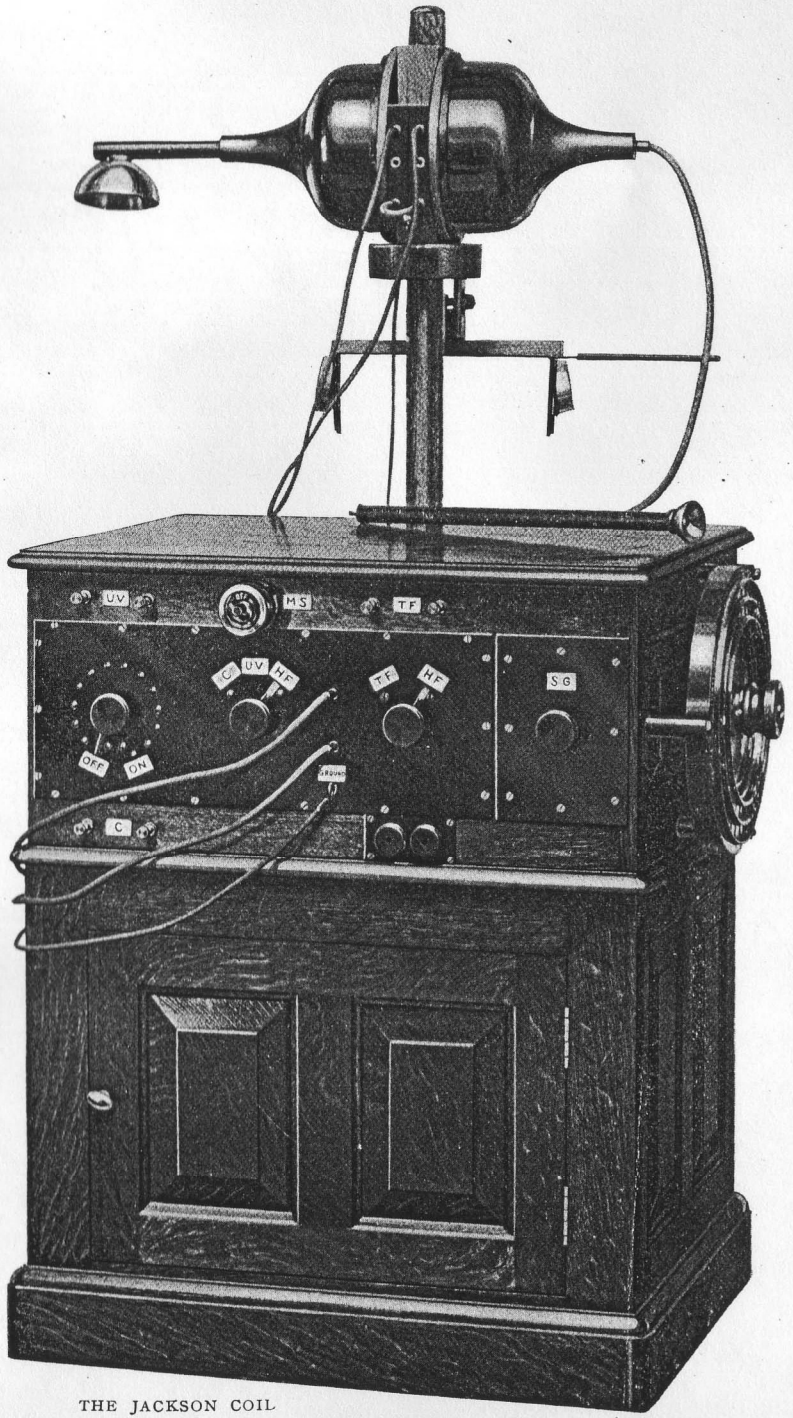
The Jackson Coil

TO meet the demand for a High Frequency Coil from which the breeze current, similar to that from a static, can be obtained, this Coil has been devised. It is the result of several years' experimental work on the part of the inventors, Messrs. Kinraide and Jackson.

The Jackson Coil has no moving parts and the primary current is not interrupted. The fact of not having to deal with a complicated, dirty interrupter that always needs tinkering and petting will be appreciated by the busy physician. No interrupter has yet been made that will successfully handle currents of voltages commonly used in lighting service, without annoyance. Some possess one bad feature and some another, but those who have used several interrupters will agree that there are serious drawbacks to every one, and the expense of maintenance is not to be disregarded. It is a disagreeable task to clean an interrupter using mercury or acid, and even the replacing of platinum points is a serious expense. In this Coil there is nothing to wear out or overheat, and when adjusted to give a certain current it will run for hours without any variation or attention whatever. As shown in the illustration, the apparatus is enclosed in a very handsome quartered oak cabinet resting on the floor, finished on all four sides, which makes it an ornament to any office. The top of the cabinet is perfectly plain. The switches and regulating devices are placed where they will be readily accessible, and everything is so constructed that no metal parts whatever project from the cabinet, making it impossible to receive an accidental shock. There is no delicate mechanism exposed. The Coil can easily be kept in the very best shape with a minimum amount of labor. All the working parts of the coil proper are in the upper part of the cabinet, the top of which can readily be removed.

The Coil is designed to run on an alternating circuit, and when a direct current only is available, a rotary converter is placed in the base of the cabinet and controlled from the outside. The converter is of the best design, of ample proportions, and capable of running for hours without attention, so that the apparatus is equally



THE JACKSON COIL

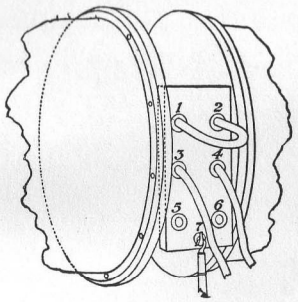
efficient on either circuit. When the Coil is run on the alternating service, the lower part of the cabinet is not needed, and may be used for the storage of tubes and other paraphernalia. If the direct current should be given in the daytime and alternating at night, or vice versa, a small switch would enable the Coil to be run at all times.

A new feature of the Jackson Coil is the spark gap (see cut), which is the fundamental part of every high frequency or oscillating system. This has been developed on an entirely new plan and does not need any attention whatever. It is entirely out of sight and does not annoy the operator by light or noise, as in some forms of apparatus. It is placed in a small drawer or slide, so that it is instant y accessible, and if removed cannot be replaced in any but the right way. It is the result of patient research and countless experiments, that were discontinued only after it was deemed certain that no further improvement could possibly be made. It is easily adjustable and the sparks flow across with absolute steadiness in any position. An entirely new method of cooling the electrodes is used, which is perfect in its action and requires no water or other outside aid. The sparking takes place between two prisms of ample length, which will last during months of continuous hard work. Each prism has four edges which may be used, and it is but the work of a moment to change them or put in new ones, which cost but little.

The transformer used is of ample size to deliver a large current at a very high voltage, and is capable of standing the entire current direct from the street. A rheostat is used for purposes of regulation only. The condenser is simple, reliable, and will give no trouble.

In view of the fact that currents of extreme high frequency and voltage cannot be transmitted through even a heavily insulated conductor for a few feet without great loss, it has been deemed advisable to bring the final transformer, in the form of a pair of secondaries, close to the patient, instead of attempting to bring the patient up to the cabinet. These secondaries are mounted upon an attractive floor stand so that they may be readily adjusted at any convenient height, and are connected by means of a flexible cable to the cabinet. In the illustration of the Coil, this stand is shown directly behind the cabinet. The base is large and heavy enough to preclude the possibility of being overbalanced. By this arrangement, a very high frequency current of great volume may be delivered to the person of the patient with small loss. The current required to excite these secondaries is of such a character as to flow readily through a cable of moderate length, which

can be handled with perfect safety, even when delivering the full output. A unique tube holder, capable of every adjustment, may be attached to the secondary stand at will, making an unexcelled device for X-Ray work. The tube holder may, when not in use, be turned down out of the way, as shown in the cut of the coil.



The secondaries proper are of the same design as those in the Kinraide Coil, a thin disc of fine wire embedded in an insulating compound and placed inside of a protecting case. This arrangement, with a ground wire, gives perfect protection from a breakdown or an accident. The full discharge can be grounded with no strain on the insulation, and the ground between the two secondaries does not diminish or interfere with the application of both secondaries to the patient. The multiple primaries in each of the secondaries are a new feature. These primaries are so arranged that, by means of a very simple switching device, three different combinations of primary are obtained as applied to each secondary coil, so that either secondary may be used independently or both together with any combination; thus giving a variety of effects with one instrument — never before approached — combined with the utmost simplicity. The current of the highest frequency is obtained from the primary of the fewest turns, combined with the shortest length of the spark gap. All of these combinations can be varied at will by means of a rheostat of fifty steps and the latest pattern, so that infinite delicacy of adjustment may be obtained. The current consumption of the Coil is small. Unlike most pieces of apparatus which take but a small amount of current to excite, the quantity of high frequency current generated is large, and the apparatus is of a high degree of efficiency.

This Coil may be so manipulated as to produce a surprising variety in the discharge. A soft blue breeze can be obtained of long, feathery, fern-like, positive discharge, which will be given off in every direction. These are soft and attractive in appearance. Fierce spark rays may be generated, interspersed with pink, snaky flames. At times, the discharge from the secondary may be entirely positive and can be readily recognized. At other times, a purely negative discharge is given from the ball, each point of discharge being surmounted by a positive discharge drawn in from the surrounding air. The effects of positive or negative discharge produce quite different sensations. These changes are due to the various frequencies readily obtained by the unique spark gap and possible with no other type of apparatus known.

Users of high frequency apparatus have demonstrated that some diseases yield more readily to currents of low frequency, some to currents of moderate, and still others to extremely high frequency. Owing to the great flexibility of this apparatus, it will be found to meet the requirements of all. The application of the current by means of vacuum electrodes is extremely easy, and the same effect can always be repeated by the same adjustments. New designs in metallic electrodes have been devised, which will give a splendid high frequency spray or spark at the end of a flexible cable. The brush discharge from the crown electrode is long and of the utmost fineness and smoothness, and of such a character that great latitude can be allowed in the treatment without accidentally sparking the patient. This point alone is of great value.

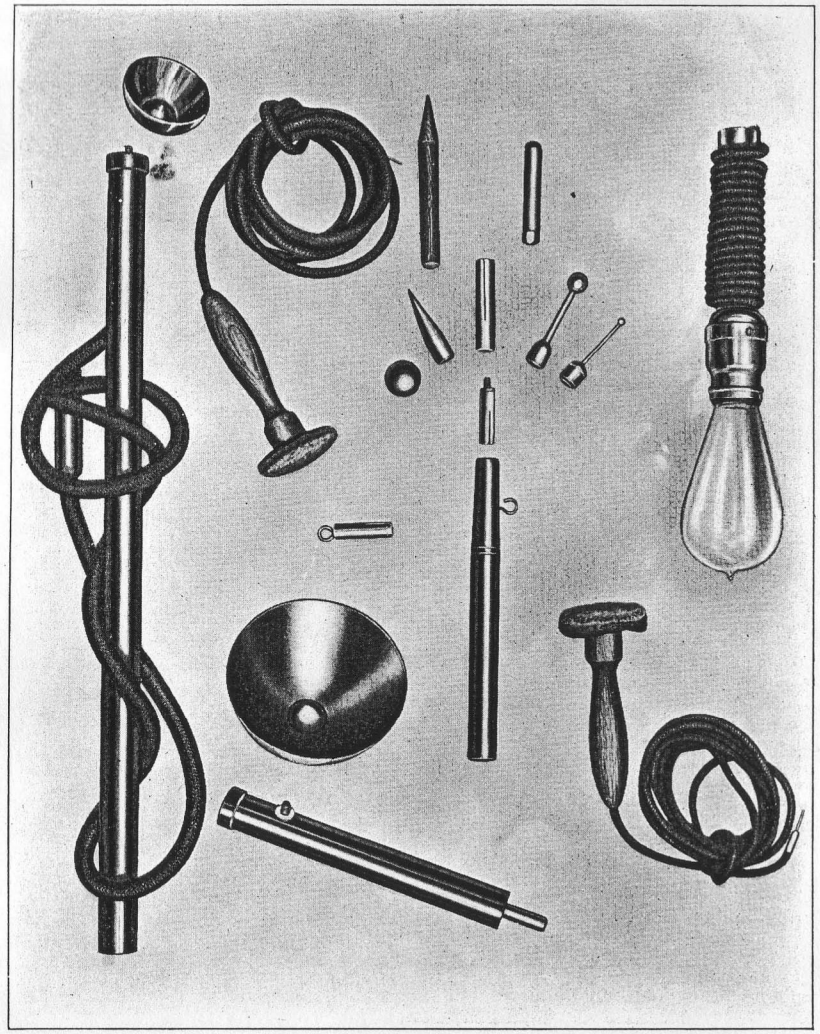
The whole effort of the designers of this Coil has been to produce an easily manipulated apparatus, giving a wide range of effects, any one of which can be repeated at any time by the same adjustments, which are easily comprehended and remembered. Although the appearance of the cabinet is simple and convenient, yet the amount and variety of hard work that can be obtained from it at any time will put far in the background the most powerful static machine, the large Rhumkorff Coil with its cumbersome high frequency attachment, and any ultra violet apparatus on the market, to say nothing of the cautery.

We do not believe it is possible by any other means of construction to produce a Coil capable of giving such enormous voltages and frequencies without quickly destroying itself. The Coil has been given the most exhaustive and thorough tests, and has met every requirement imposed upon it by the most exacting.

We have no hesitation in saying that there is no apparatus more flexible or under more perfect control for operating an X-Ray tube, or for high frequency work. A Geissler tube can be excited so that it will glow to any degree of brilliancy, and this light will remain absolutely steady as long as required. The Coil will deliver such an amount of current as to be beyond the capacity of most X-Ray tubes, or so little that the smallest tube can be made to barely glow. In X-Ray practice, by means of the spark gap alone, the bones of the hand may be seen as almost transparent or the whole hand itself may be made black, and this without change of vacuum in the tube.

THERMO-FARADIC

A unique feature, which we believe is found in this Coil only, is a Thermo-Faradic attachment; which, briefly stated, is a derived circuit from a closed coil of a certain proportion. The current is



ELECTRODES FOR JACKSON COIL

applied to the patient by means of either the well-known sponge electrodes or metallic handles, and can be widely varied by means of the spark gap and rheostat from a current markedly faradic in its characteristics and possessing great smoothness, to a current having no faradic effects and producing within the body a sensation of great heat; and that this is real heat locally generated is demonstrated by actual heating of the sponges, and by the sensations of the patient. If the metal electrodes are brought in close proximity to each other, a small but brilliant arc is produced of such intense heat that actual welding of copper (on a small scale) may be made possible. If two strips of metal are attached to this Coil and are placed in a little water, it will soon become very hot. By placing both of the electrodes on or near the diseased area, the effect will be strictly local; or by separation, widely diffused. Sufficient current may be taken in this manner without discomfort to bring to full brilliancy a sixteen candle power lamp, when placed in the same circuit with the patient. These currents are of true high frequency, oscillating millions of times per second, and are a modification of the D'Arsonval currents. By the use of the Thermo-Faradic attachment, excellent results are obtained in the treatment of inflammation, neuralgia, tubercular ulcers, sciatica and neurasthenia. The mode of operation is described in Bulletin 36.

CAUTERY EFFECTS

A powerful cautery transformer may be incorporated in the cabinet at a slight additional cost. The transformer gives a very large quantity of current at so low a voltage that diagnostic lamps or cautery knives may be used with perfect safety. The control is perfect and the graduations are fine. This transformer is entirely separate from and has no connection with the high frequency Coil, and there is absolutely no chance of getting a high voltage through it.

ULTRA VIOLET ATTACHMENT

If desired, the Ultra described on page 28 may be incorporated into this cabinet, making a simple, serviceable, and powerful Ultra Violet equipment.

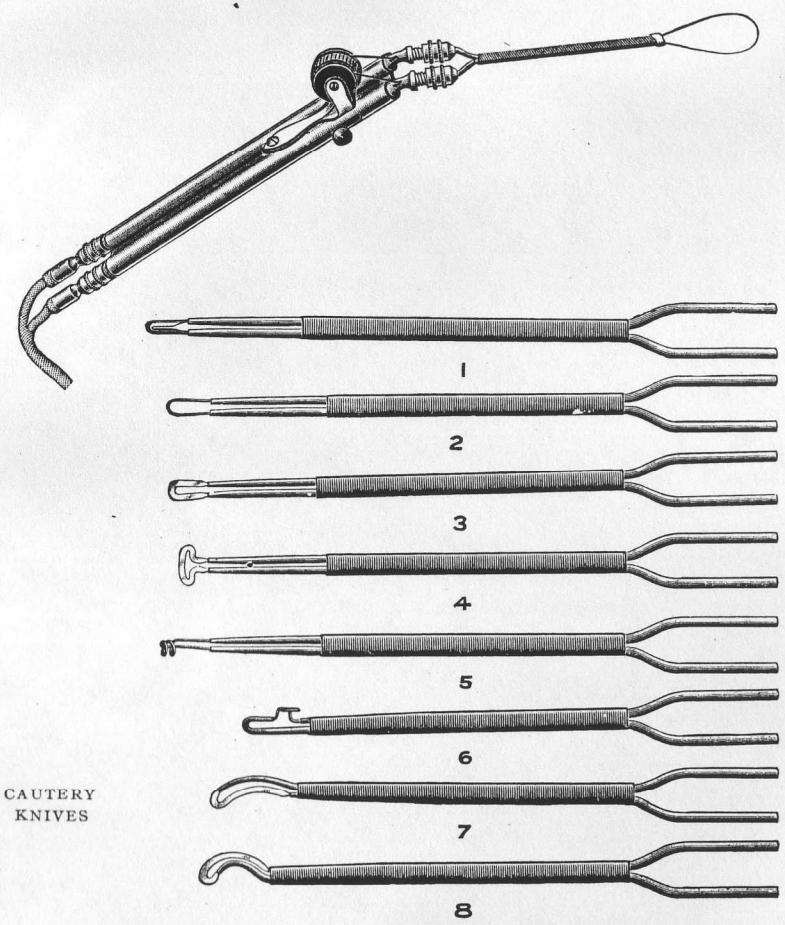
A very simple switching device is supplied and the lamp proper may be attached in place of the tube stand.

GUARANTEE

Each Coil guaranteed against any defect in workmanship or material, or against burn-out not caused by improper usage, for one year from date of shipment.

CODE WORDS

52 volts, 7,200 Alternations	Koperig
104 volts, 7,200 Alternations	Kopernikus
110 volts, 7,200 Alternations	Koperkies
52 volts, 16,000 Alternations	Koperkleur
110 volts, 16,000 Alternations	Kopermolen
110 volts, 15,000 Alternations	Kopermunt
110 volts, Direct Current	Intardatum
220 volts, Direct Current	Intardetis
235 volts, Direct Current	Intarlando
250 volts, Direct Current	Intarlare
500 volts, Direct Current	Intarlato



CAUTERY KNIVES

PRICE LIST

JACKSON HIGH FREQUENCY COIL, to run on any alternating current from 52 to 250 volts and any commercial cycle, complete as shown in cut, page 4, including electrodes, stand and tube holder . . . Price, $350.00
Code word, Heidengeld.

JACKSON HIGH FREQUENCY COIL for 110 volts direct current, as above, including motor generator . . . . . Price, $420.00
Code word, Headledge.

JACKSON HIGH FREQUENCY COIL for 220 volts direct current, as above, including motor generator . . . . . Price, $440.00
Code word, Heenkomen.

MOTOR GENERATOR including starting box, for 110 volts direct current, when sold without coil . . . . . Price, $70.00
Code word, Hervatting.

MOTOR GENERATOR including starting box, for 220 volts direct current, when sold without coil . . . . . Price, $90.00
Code word, Hervimos.

MOTOR GENERATOR including starting box, for 500 volts direct current, when sold without coil . . . . . Price on application
Code word, Hervento.

CAUTERY TRANSFORMER, additional . . . . . Price, $25.00
Code word, Curtelasse.

This transformer put up in fine case, to use separately from coil, $20.00.
Code word, Curtinho.

CAUTERY HANDLE with snare . . . . . Price, $6.00
Code word, Curtem.

CAUTERY HANDLE, plain . . . . . Price, $1.50
Code word, Curtiamos.

CAUTERY CORDS, per pair . . . . . Price, $1.50
Code word, Curtidos.

CAUTERY KNIVES, No. 1 to No. 8 . . . . . Price, each $0.75
See illustration on page 10.
Code word for set of eight, Curtilage.

ULTRA VIOLET ATTACHMENT, including lamp, cable and arm for tube stand . . . . . Price, $60.00
Code word, Conjunctum.

COMPRESSOR with fine quartz lens . . . . . Price, $5.00
Code word, Condate.

SET OF METALLIC HIGH FREQUENCY ELECTRODES, when sold separately . . . . . Price, $10.00
Code word, Hervencia.

SET OF SIX GLASS VACUUM ELECTRODES with handle Price, $5.00
Code word, Koukarien.

SPECIAL H. F. X-RAY TUBE, as shown on page 6. . . . Price, $14.00
Code word, Depor.

MINERAL TUBES, to be used as electrodes, 20 inches long, very brilliant.
Code word, Denuam. Price, each $3.00

GEISSLER ELECTRODES, No. 17 and No. 18 filled with liquid, very highly colored. Price, each $2.00. Special set of six assorted colors, Price, $10.00

Code word, No. 17, Kourgan; No. 18, Kourilien; set of six, Kozel.

WILLEMITE TUBE, small X-Ray tube with piece of willemite for anode, very handsome and brilliant . . . . . Price, $6.00

Code word, Demptos.

BLOCK TIN for X-Ray shields, per pound, $0.25. A strip thirty-six inches long by fifteen inches wide makes a pound.

Code word, Blemmyer.

LIST OF OUTFITS

In connection with any of the following outfits, a Milliamperemeter is recommended. This may be included at an additional cost of $30.00.

These outfits are given as samples only, and may be changed to suit the convenience of the purchaser.

OUTFIT NO. 60. For the alternating current.
Code word, Handlohn.

One Jackson Coil, complete, including set of metallic electrodes and tube stand	$350.00
One H. F. X-Ray Tube	14.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of Vacuum Electrodes with Handle	5.00
	$379.00

OUTFIT NO. 61. For the 110 volts direct current.
Code word, Handlubben.

Same as enumerated in Outfit No. 60	$379.00
One Motor Generator, complete, fitted in cabinet	70.00
	$449.00
For 220 volts, add to above, $20.00	

OUTFIT NO. 62. For the alternating current.
Code word, Handlung.

One Jackson Coil, complete, including set of metallic electrodes and tube stand	$350.00
Two H. F. X-Ray Tubes	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of Vacuum Electrodes with Handle	5.00
One No. 17 and one No. 18 Electrode	4.00
Four pounds Block Tin	1.00
	$398.00

OUTFIT NO. 63. For the 110 volts direct current.
Code word, Handmagd.

Same as enumerated in Outfit No. 62	$398.00
Motor Generator, complete and fitted in cabinet	70.00
For 220 volts, add to above, $20.00.	$468.00

OUTFIT NO. 64. For the alternating current.
Code word, Handmaiden.

One Jackson Coil, complete, including set of metallic electrodes and tube stand	$350.00
Two H. F. X-Ray Tubes	28.00
One 6 x 8 Platinum Barium Cyanide Fluoroscope	16.00
One set of Vacuum Electrodes with Handle	5.00
One set of six No. 17 and No. 18 Electrodes	10.00
One roll of Block Tin, 10 pounds	2.50
Two Mineral Tubes	6.00
One Willemite Tube	5.00
	$422.50

OUTFIT NO. 65. For the 110 volts direct current.
Code word, Handmandel.

Same as enumerated in Outfit No. 64	$422.50
Motor Generator, complete and fitted in cabinet	70.00
For 220 volts, add to above, $20.00	$492.50

OUTFIT NO. 66. For the alternating current.
Code word, Handmesser.

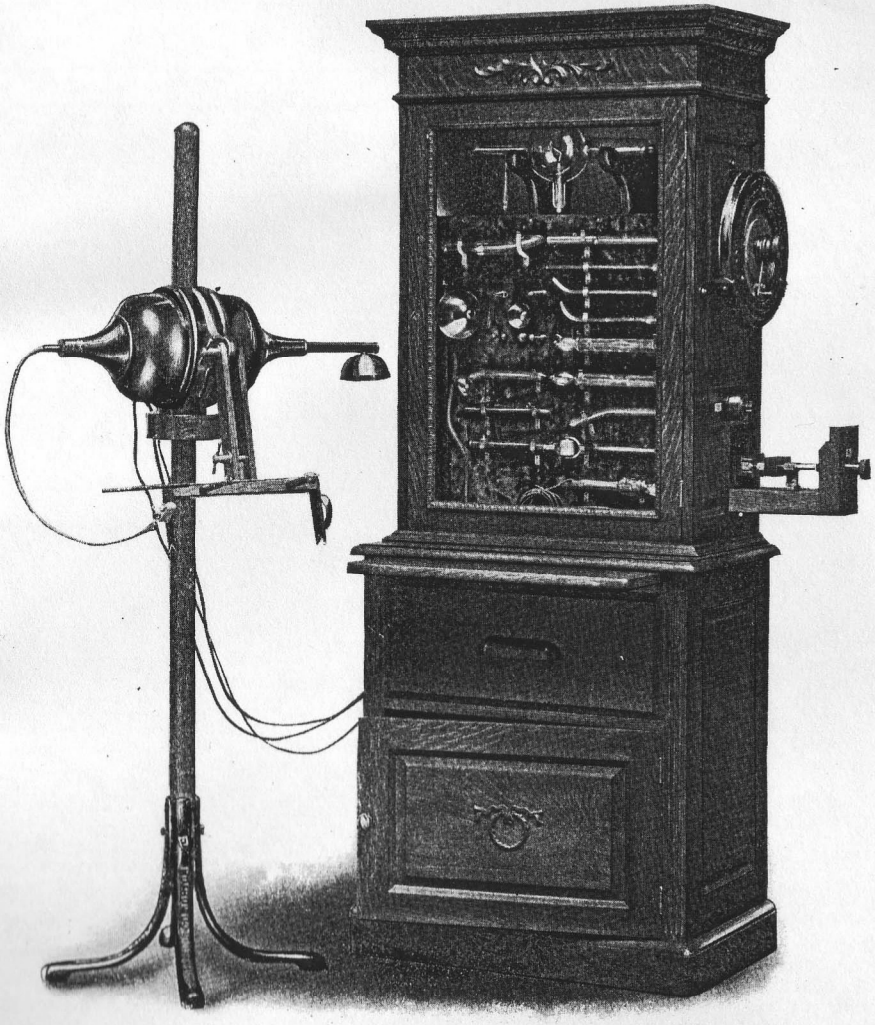
One Jackson Coil, complete, including set of metallic electrodes and tube stand	$350.00
Two H. F. X-Ray Tubes	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of Vacuum Electrodes with Handle	5.00
One set of six No. 17 and No. 18 Electrodes	10.00
One roll of Block Tin, 10 pounds	2.50
Two Mineral Tubes	6.00
One Willemite Tube	6.00
Cautery Attachment	25.00
One Handle and Snare	6.00
Eight Cautery Knives	6.00
Ultra Violet Attachment	60.00
One Quartz Compressor	5.00
One pair Cautery Cords	1.50
	$521.00

OUTFIT NO. 67. For the direct current.
Code word, Handmolen.

Same as enumerated in Outfit No. 66	$521.00
One Motor Generator complete, fitted in cabinet	70.00
For 220 volts, add to above, $20.00.	$591.00

If the Ultra Violet Attachment is desired in addition to any of the above outfits, except No. 66 and No. 67, where it is included, add $60,00, and for Cautery Transformer add $25.00, also price of handle, knives and cords as desired. See page 11.

In ordering, use outfit number or code word. Be sure to specify the current on which the coil is to be used, and if alternating current, the number of alternations as well as the voltage. For list of code words for the various currents, see page 10. Example: if you wish to order outfit No. 62, coil to be used on a current of 104 volts, 7200 alternations, to be shipped by express, wire as follows:—Express Handlung Kopernikus.



THE JACKSON SPECIAL COIL

The Jackson Special Coil

THIS cabinet was designed especially for those who wish to make an elaborate display in their office with a minimum of floor space. The wood work is of beautifully quartered oak, finely finished. The cabinet is about six and one-half feet high and well proportioned. The door or doors forming the front of the top section of the cabinet are of heavy bevelled plate glass.

As shown in the cut, the electrodes are mounted on a fine piece of velvet and make a very rich and handsome display. This arrangement makes them all easily accessible and protects them from injury. Brackets for two tubes are provided at the top.

The cabinet is built in two pieces as a matter of convenience in shipping and handling. In the lower section a sliding shelf is provided which will be found of great convenience. Below this is a large and deep drawer, so that an extra tube and fluoroscope may be placed therein. At the bottom of the cabinet is a door, back of which is a space sufficiently large to take a motor generator, if the coil is to be run on direct current, or which may be used for storage if the alternating current is used.

As shown in the cut, the spark gap, rheostat, and starting switch are located on the side of the cabinet out of the way but easy of access. The same design of portable secondaries is used as in the regular Jackson Coil, for only by this method can the entire output of the coil be delivered to the patient without leakage. It is a well-known fact that currents of extremely high frequency, as generated by this Coil, cannot be carried for any distance without great loss. The treatment by these portable secondaries is an important feature embodied in no other coil and fully covered by our patents.

All currents, High Frequency, Sinusoidal, X-Ray, Thermo-Faradic, and D'Arsonval, which are obtainable from the regular Jackson Coil, may be procured from the Jackson Special Coil. The ultra violet and cautery attachments cannot be included.

PRICE LIST

JACKSON SPECIAL COIL, shown in cut, including all electrodes, cords, and tube stand, for alternating current . . . . . Price, $380.00
Code word, Kaiserhut.

JACKSON SPECIAL COIL for 110 volts, direct current, as above, including motor generator . . . . . Price, $450.00
Code word, Kaiserin.

JACKSON SPECIAL COIL for 220 volts, direct current, as above, including motor generator . . . . . Price, $470.00
Code word, Kaiserling.

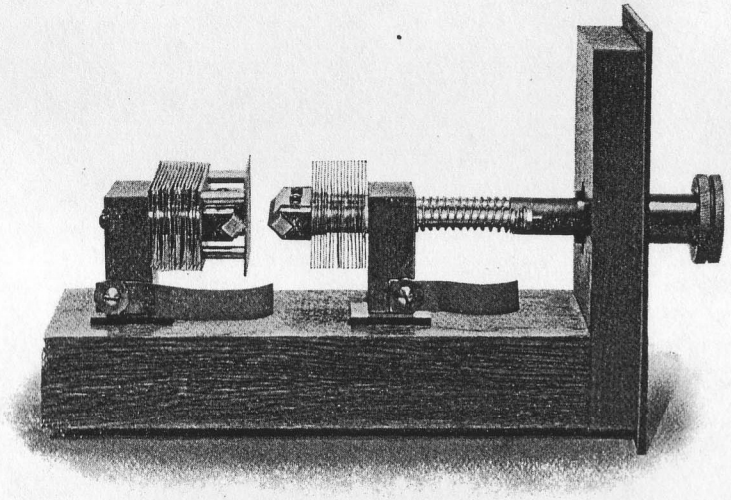
OUTFIT NO. 68. For the alternating current.
Code word, Kalomel.

Jackson Special Coil, as shown in cut	$380.00
One H. F. X-Ray Tube	14.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
Four pounds Block Tin	1.00
	$405.00

OUTFIT NO. 69. For the 110 volt direct current.
Code word, Kalong.

Same as in Outfit 68	$405.00
Motor Generator fitted in cabinet	70.00
	$475.00

For 220 volt, direct current, add to the above $20.00.



THE SPARK GAP

The Cyclone X-Ray and High Frequency Coil

WE take pleasure in announcing to our friends of the medical profession the completion of a perfect X-Ray and High Frequency Coil.

This Coil, combining as it does all the best features of the Kinraide Coil with the spark gap and thermo-faradic attachment of the Jackson Coil, is, we confidently believe, the best for all-round work ever brought to your attention.

The cuts on pages 18, 20, 22, show the Coil in its various forms. The first, or floor type, is designed strictly for office use. The cabinet is of selected quartered oak, well finished. In the base are three drawers, two large and one small. The large ones are arranged to take tubes, fluoroscopes, etc., and the small one to take vacuum electrodes, cords, and the smaller parts.

All switches and connections are conveniently placed on the front of the cabinet and are flush with the woodwork, so there is no chance of breakage or accidental shock. The spark gap is perfectly accessible, very easy of adjustment, and will run for hours without attention.

The tube stand is very conveniently arranged. The upright is attached to the side of the cabinet and the arm for holding the tube may be used in connection with the floor stand, if desired.

The whole outfit may be mounted on castors and easily moved about the office or hospital.

The Cyclone Desk Coil is really the top section described in the foregoing and is intended for use on a table or desk.

By referring to the cut, you will observe that the Portable Coil may be closed so as to make a very compact case, the dimensions being eight inches wide, ten inches high, twenty-one inches long, and may be carried in a street car or other conveyance. The tube stand, discharge rods, etc., may also be placed inside the case. A strap is provided for convenience in carrying. The case itself is made of selected hard wood, beautifully finished, and very ornamental. It is so constructed that the top section cannot be acci-

THE CYCLONE CABINET COIL

dentally displaced. To assemble, it is necessary only to lift off the top of the case and invert it.

As will be seen, each coil is complete in itself, and to operate it is necessary only to connect to the lamp socket by means of a cord and plug. The above coils differ only in the method of mounting. The winding, general construction and effects are the same in each case. The efficiency is very high, the volume of current given large, and the reliability absolute. They may be run continuously for hours without stopping, adjusting, or overheating.

THE SPARK GAP

The Spark Gap is a modification of the one which has been so heartily endorsed by the users of the Jackson Coil. This gap will run indefinitely without any attention whatever. It is adjusted by turning a screw on the outside of the case. There is no appreciable noise or light to annoy a sensitive patient. To quote from a user of one of these gaps, " It is perfect, and gives absolutely no trouble." The regulation is excellent, the mechanism is simple and impossible to get out of order. This sounds like perfection, but it is an absolute fact which will be proved by use in each case.

REGULATION

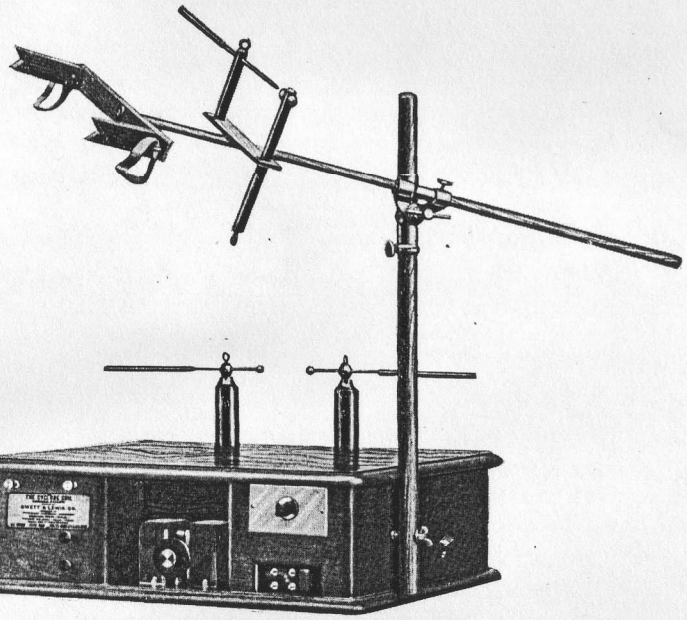
To attach the coil to the electric-light current, screw the plug on the end of the cord into the lamp socket, and slip the connector over the proper pair of pins designed for it. It will be observed that there are three sets of these. When the first set is used, the output of the coil is small and excellently adapted for vacuum electrode work. Great range is possible, for by means of the spark gap any desired effect may be obtained in the electrode from very faint illumination to the most brilliant and powerful. No rheostat is required.

X-RAY

The second set of pins is designed to give more power, and may be used for light X-Ray work where high penetration is not desired, for treating diseases of the skin, etc., also for operating thermo-faradic. Here the same range is procurable.

The third set of pins is used for the heaviest X-Ray work. Too much cannot be said of this. The fluoroscopic effects are fine, the penetration and definition are unexcelled. Pictures may be made in exceedingly short time.

The tube stand is ingeniously arranged. It may be slipped



THE CYCLONE DESK COIL

CARRYING CASE FOR TUBES, ETC.

into position instantly, and is capable of all necessary adjustments. A spark gap device for lowering the vacuum in the X-Ray tube is also provided.

It is our belief that these coils will fill a long-felt want, giving as they do the various X-Ray and high frequency currents hitherto obtainable only in large and expensive apparatus. The consumption of electricity is small, therefore the cost of running is very light.

The coils are designed to run from the alternating current exclusively. When only the direct current can be obtained, a rotary converter may be furnished to supply the alternating current. For cost, see price list.

PRICE LIST

THE CYCLONE COIL, Floor Type, including tube stand and connecting cords, fitted to run on any alternating current . . . . Price, $210.00
Code word, Gloriation.

THE CYCLONE COIL, Desk Type, including tube stand and connecting cords, fitted to run on any alternating current . . . . Price, $185.00
Code word, Gloriavamo.

THE CYCLONE COIL, Portable Type, including tube stand and connecting cords, fitted to run on any alternating current . . . . Price, $185.00
Code word, Glorificar.

ROTARY CONVERTER for changing the 110 volt direct current to alternating . . . . . Price, $70.00
Code word, Hervatting.

ROTARY CONVERTER for changing the 220 volt direct current to alternating . . . . . Price, $90.00
Code word, Hervimos.

LIST OF OUTFITS

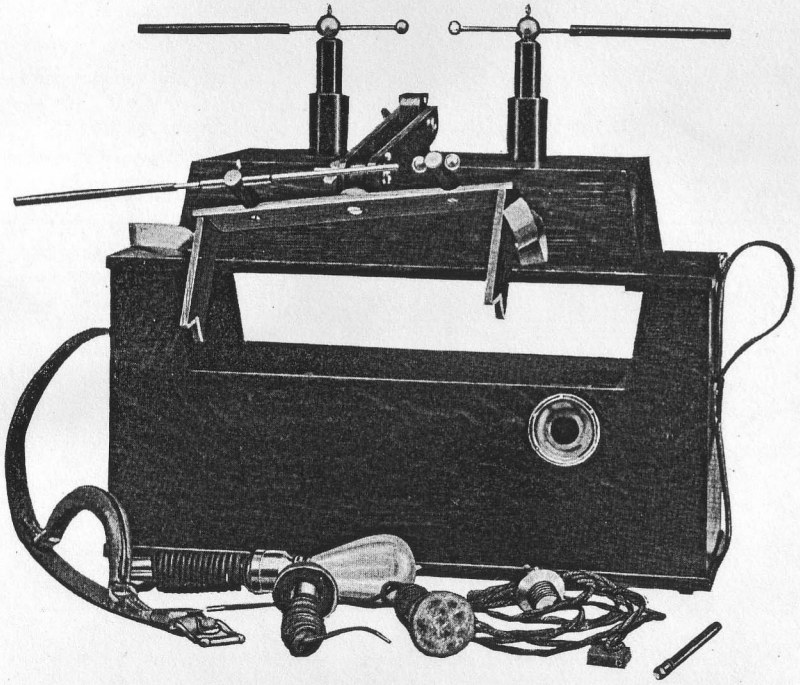
OUTFIT NO. 70. For the alternating current.
Code word, Kaaskamer.

The Cyclone Coil, Floor Type, including tube stand	$210.00
One H. F. X-Ray Tube	14.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of Vacuum Electrodes	5.00
	$239.00

OUTFIT NO. 71. For 110 volts, direct current.
Code word, Kaaskoek.

Same as enumerated in Outfit No. 70	$239.00
Rotary Converter	70.00
	$309.00

For 220 volts, add $20.00 to above.



THE CYCLONE PORTABLE COIL — OPEN

THE CYCLONE PORTABLE COIL — CLOSED

OUTFIT NO. 72. For the alternating current.
Code word, Kaaskooper.

The Cyclone Coil, Floor Type, including tube stand	$210.00
Two H. F. X-Ray Tubes	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of Vacuum Electrodes	5.00
Four pounds X-Ray Foil	1.00
One No. 17 and one No. 18 Electrode	2.00
	$256.00

OUTFIT NO. 73. For 110 volts, direct current.
Code word, Kaaskorf.

Same as enumerated in Outfit No. 72	$256.00
Rotary Converter	70.00
	$326.00

For 220 volts, add $20.00 to above.

OUTFIT NO. 74. For the alternating current.
Code word, Kaasleb.

The Cyclone Coil, Floor Type, including tube stand	$210.00
Two H. F. X-Ray Tubes	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
Four pounds X-Ray Foil	1.00
One set of six No. 17 and No. 18 Electrodes	10.00
One set of Vacuum Electrodes	5.00
Two Mineral Tubes	6.00
One High Frequency Milliamperemeter	30.00
Base and Standard of Floor Stand	5.00
	$305.00

OUTFIT NO. 75. For 110 volts, direct current.
Code word, Kaasmaden.

Same as enumerated in Outfit No. 74	$305.00
Rotary Converter	70.00
	$375.00

For 220 volts, add $20.00 to above.

OUTFIT NO. 76. For the alternating current.
Code word, Rhodanicum.

The Cyclone Coil, Desk Type, including tube stand	$185.00
One H. F. X-Ray Tube	14.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of Vacuum Electrodes	5.00
	$214.00

OUTFIT NO. 77. For 110 volts, direct current.
Code word, Rhodanthes.

Same as enumerated in Outfit No. 72	$214.00
Rotary Converter	70.00
	$284.00

For 220 volts, add $20.00 to above.

OUTFIT NO. 78. For the alternating current.
Code word, Rhodanusia.

The Cyclone Coil, Desk Type, including tube stand	$185.00
Two H. F. X-Ray Tubes	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of Vacuum Electrodes	5.00
Four pounds X-Ray Foil	1.00
One No. 17 and one No. 18 Electrode	4.00
	$233.00

OUTFIT NO. 79. For 110 volts, direct current.
Code word, Rhodees.

Same as enumerated in Outfit No. 78	$233.00
Rotary Converter	70.00
	$303.00

For 220 volts, add $20.00 to above.

OUTFIT NO. 80. For the alternating current.
Code word, Rhodensium.

The Cyclone Coil, Desk Type, including tube stand	$185.00
Two H. F. X-Ray Tubes	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
Four pounds X-Ray Foil	1.00
One set of six No. 17 and No. 18 Electrodes	10.00
One set of Vacuum Electrodes	5.00
Two Mineral Tubes	6.00
One High Frequency Milliamperemeter	30 00
Base and Standard of Floor Stand	5.00
	$280.00

OUTFIT NO. 81. For 110 volts, direct current.
Code word, Rhodiacos.

Same as enumerated in Outfit No. 80	$280.00
Rotary Converter	70.00
	$350.00

For 220 volts, add $20.00 to above.

OUTFIT NO. 90. For the alternating current.
Code word, Krent.

The Cyclone Coil, Portable Type, including tube stand	$185.00
One H. F. X-Ray Tube	14.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of six Vacuum Electrodes	5.00
Four pounds X-Ray Foil	1.00
	$215.00

OUTFIT NO. 91. For the alternating current.
Code word, Krepp.

The Cyclone Coil, Portable Type, including tube stand	$185.00
Two H. F. X-Ray Tubes	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of six Vacuum Electrodes	5.00
Eight pounds X-Ray Foil	2.00
One set of six Electrodes, No. 17 and No. 18	10.00
One Carrying Case for tubes and electrodes	10.00
	$250.00

OUTFIT NO. 92. For the alternating current.
Code word, Kresse.

The Cyclone Coil, Portable Type, including tube stand	$185.00
Two H. F. X-Ray Tubes	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of six Vacuum Electrodes	5.00
Four pounds X-Ray Foil	1.00
One No. 17 and one No. 18 Electrode	4.00
Two Mineral Tubes	6.00
One High Frequency Milliamperemeter	30.00
One Carrying Case for tube and electrodes	10.00
One Floor Tube Stand	10.00
	$289.00

These prices include the necessary connecting cords.

A nicely finished Carrying Case may be furnished for transporting X-Ray tube, electrodes, etc. ..... Price, $10.00
Code word, Bisam.

To any of the above outfits may be added the base and standard of the Floor Stand, shown on page 32, to which the Tube Stand furnished with each coil may be attached, for $5.00.
Code word, Beffen.

If the direct current only is available, add to the above prices the cost of the rotary converter.

Books

Radiotherapy, Phototherapy and High Frequency Currents — *Allen*	$4.50
Radiotherapy and its Application to Skin Diseases — *Belot*	4.50
Currents of High Potential of High and Other Frequencies — *Snow*	2.50
Conservative Gynecology and Electro-Therapeutics — *Massey*	4.00
Static Electricity — *Snow*	3.00
Light Energy — *Cleaves*	5.00
Medical and Surgical Electricity — *Rockwell*	5.00
Electro-Therapeutical Practice — *Neiswanger*	2.50
Elements of General Radiotherapy — *Freund*	5.00
Vibratory Stimulation — *Pilgrim*	1.50
Mechanical Vibration Therapy — *Snow*	2.50

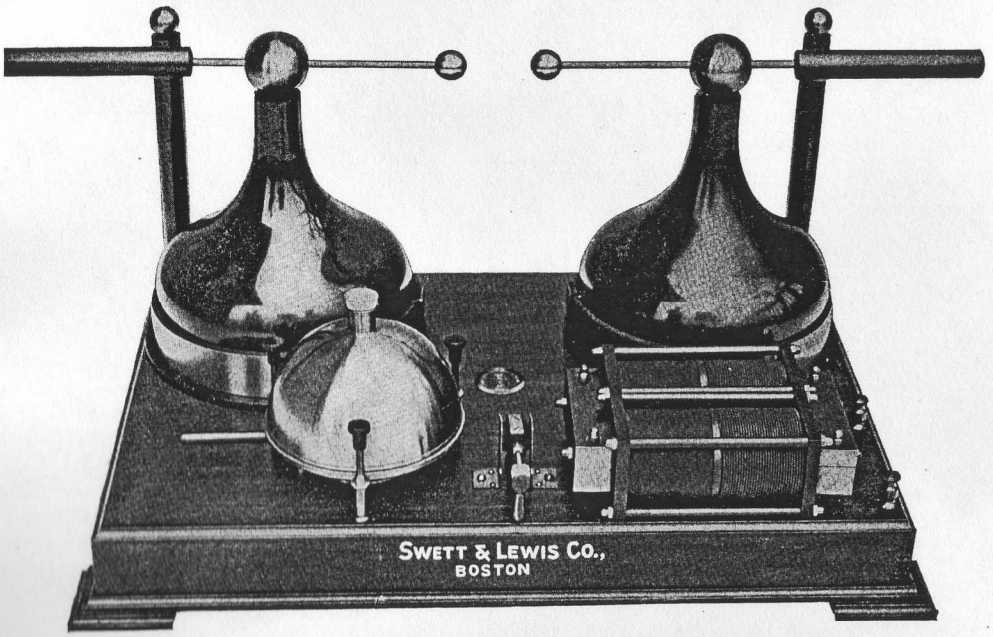
The Kinraide Coil

The Kinraide Coil is too well known to require an extended description.

Briefly, the Coil is of the high frequency type, is designed to run either on the direct or alternating current, is simple, substantial and reliable.

Owing to the peculiar method of construction, it is impossible to break it down or burn it out. The X-Ray work that may be accomplished with this Coil will compare favorably with that of any coil, anywhere near the same price. The current given is of high voltage, large quantity and of high frequency, but not as high as either the Jackson or the Cyclone coils.

For either X-Ray work or high frequency, a rheostat should be used to regulate the current.



THE KINRAIDE HIGH FREQUENCY COIL — ALTERNATING CURRENT

The Kinraide Coil	$130.00
(Direct and alternating currents of all voltages from 110 to 250)	
500-volt Coils, extra	20.00
Alternating Current Coil and Ultra combined	175.00
Rheostat	8.00

LIST OF OUTFITS

OUTFIT NO. 33. For Direct Current.
Code word, Unpublic.

One Direct Current Kinraide Coil	$130.00
Two Tubes, Type K	24.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One Floor Tube Stand	10.00
One Rheostat	8.00
	$182.00

OUTFIT NO. 34. For Alternating Current.
Code word, Vestifluam.

One Alternating Current Kinraide Coil	$130.00
Two Tubes, Type H	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One Floor Tube Stand	10.00
One Rheostat	8.00
	$186.00

OUTFIT NO. 37. For Alternating Current.
Code word, Timindos

One Alternating Current Kinraide Coil and Ultra Violet Apparatus combined	$175.00
Two Tubes, Type H.	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One Floor Tube Stand	10.00
One Rheostat	8.00
	$231.00

We recommend the purchase of a set of Vacuum Electrodes, price, $5.00, with each of the above outfits, also four pounds of X-Ray Foil, price, $1.00.

The Boston Ultra Violet Lamp

This outfit is mounted on a piece of polished slate and is intended to fasten to the wall. As in the Ultra, iron electrodes are used, with similar results. With this outfit, the patient can hold the lamp by the handle and use the crystal lens as a compressor. Sufficient cable is furnshed for all ordinary uses.

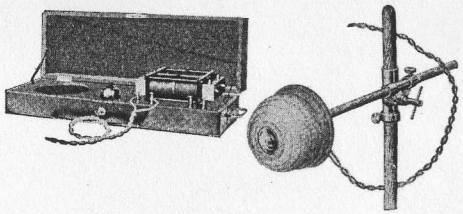
This outfit may be used on any direct current circuit up to and including 250 volts.

Code word, Eligam . . . . . Price, $30.00

Ultra Violet Effects

The Ultra shown below generates the true Ultra Violet rays with but few light rays. We have taken advantage of the fact that condenser currents of high voltage, when used in connection with iron electrodes, will produce the Ultra Violet rays with few light or heat rays.

The lamp is really a diminutive arc, entirely enclosed in a nice nickel case, and having in front a fine rock-crystal lens, which is perfectly transparent to the Ultra Violet ray. Instead of carbons, the electrodes of the lamp are of iron. They are regulated by a small thumb-screw at the back of the lamp, and are very easily adjusted. This lamp may be supported by any available stand. It is, however, designed with special reference to the floor stand illustrated on page 32 of this bulletin.



In connection with this stand, the lamp may be placed at any angle or height, and rotated in any direction with ease. Very little heat is generated and no cooling or coloring device is necessary.

The arc is very rich in invisible Ultra Violet rays, so much so that the eyes must be protected with glasses or some opaque substance at all times when near the lamp.

The cost of running a lamp of this sort is small.

Built for alternating current only.

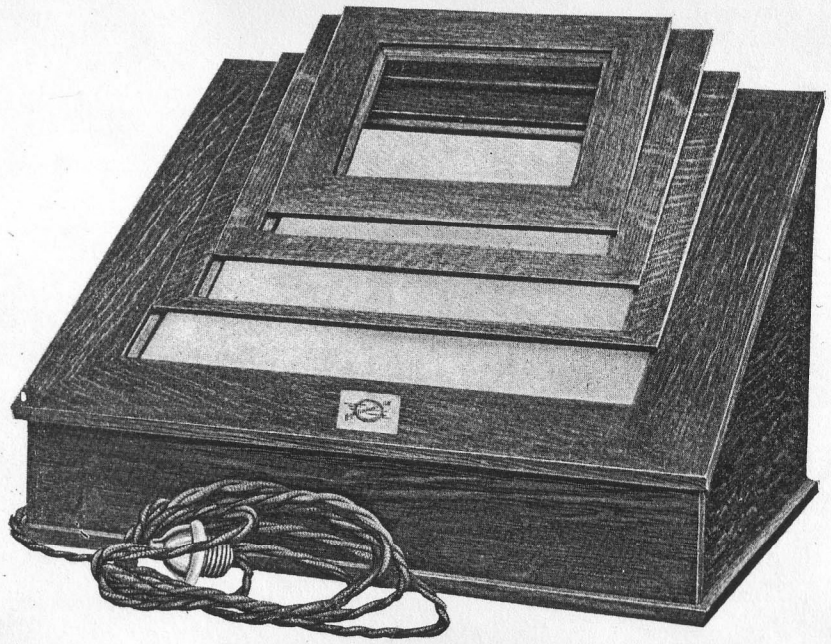
Twelve extra electrodes and full instructions for use go with each lamp.

The lamp which forms a part of this apparatus can be attached to any Kinraide Coil, run on the alternating circuit. It will, however, be necessary to send the coil to our factory in order to have the necessary switches put on and changes made. This can be done without detriment to the working of the coil.

Price complete, as shown in cut, with stand for supporting lamp . $110.00
Price without stand 100.00
Ultra Lamp, connecting cord, switches, and all necessary attachments fitted to any alternating current Kinraide Coil, new or old . . . Price, $50.00

Freight or express charges to be paid by owner of coil.

Illuminating Box



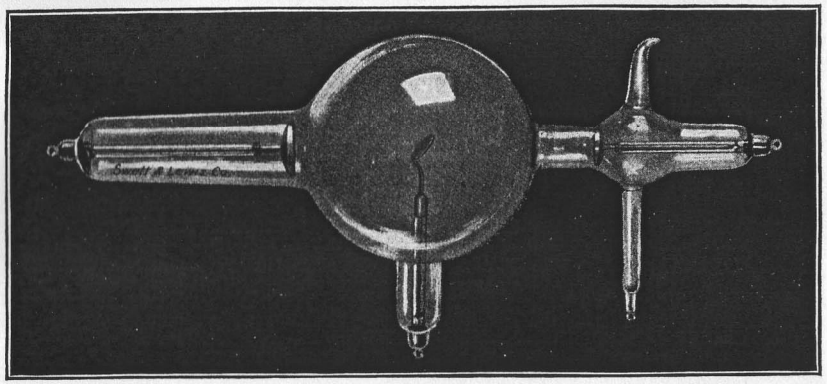
The Box is of quartered oak, nicely finished. A number of frames arranged to take the various sizes of plates are furnished. The inside is enamelled white and a sufficient number of electric lamps are so arranged as to furnish the proper degree of illumination. The top is of ground glass. When viewed in this way, a surprising amount of detail will be shown in an ordinary X-Ray negative.

Code word, Sortance . . . . . Price, $20.00

X-Ray Tubes

TYPE H. F.

The type H. F. Tube was designed specially for use with high frequency coils, and is a modification of the old Type H, combined with the valve tube so called. The reversed waves are choked back so that the hemispherical effect so familiar to static users is produced. This Tube should be a general favorite, as it is capable of very hard usage. It is recommended for all coils giving an alternating current. The Tube is strongly built, the bulb of good size,



SPECIAL H. F. X-RAY TUBE

and the terminals are well supported, so that they will not break down either in use or during transportation.

Code word, Dejor . . . . . Price, $14.00

TYPE K.

This Tube is of good size and shape and is designed for heavy work. The anode is very heavy and is supported on a steel rod. It may be heated to a bright red, and held at this point for a long time without danger of injury to the tube or anode. The definition and penetration are exceptionally good.

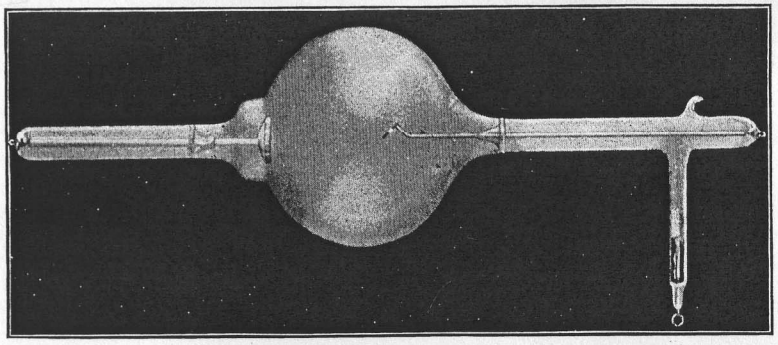
The Tube is fitted with a chemical adjustment, which may be operated either by heat or spark. If too much gas is driven off, it will be re-absorbed, if the Tube is allowed to rest for a short time.

Code word, Delustro . . . . . Price, $12.00

X-Ray Plates

A supply of the following sizes always in stock. These Plates are specially wrapped in light proof paper, no plate holder being required for use with the X-Ray.

5 x 7	$1.40 per dozen.	Code word, Einhergang
6½ x 8½	2.30 per dozen.	Code word, Einhuellen
8 x 10	3.40 per dozen.	Code word, Einimpfen
10 x 12	5.50 per dozen.	Code word, Einjæhrig
11 x 14	7.00 per dozen.	Code word, Einjagen



TYPE K, FOR DIRECT CURRENT COILS

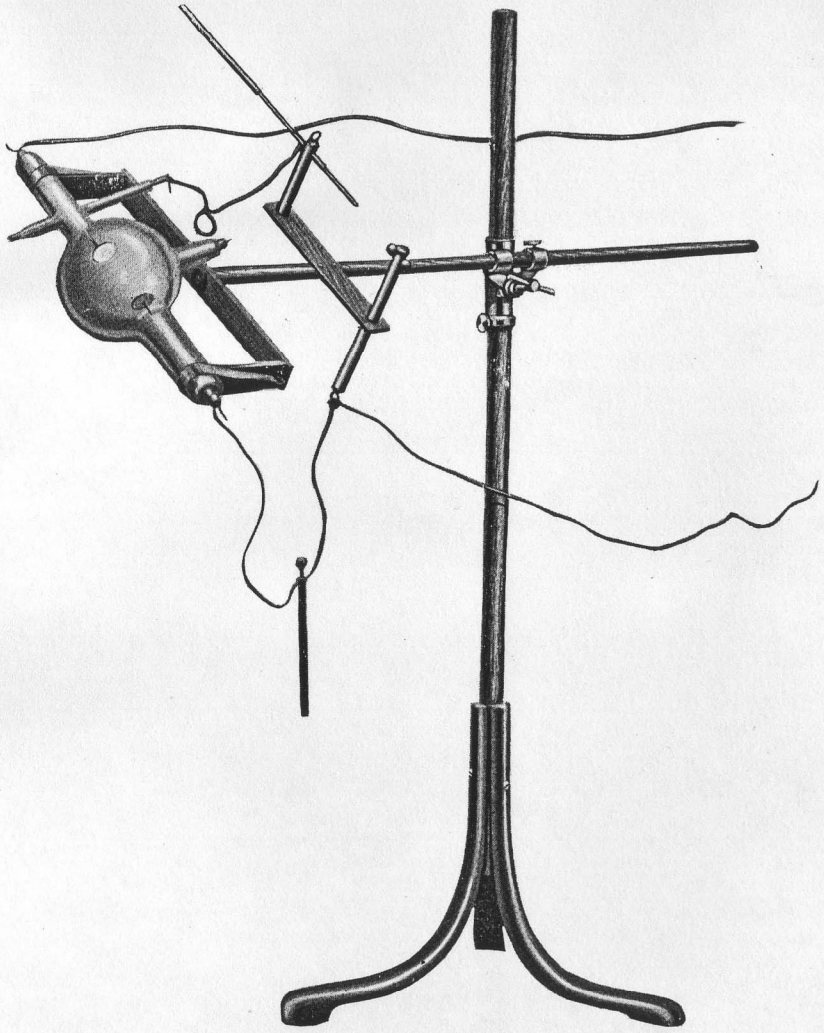
Tube Stands

(See cut on page 32)

The Stand shown in the cut is capable of all adjustments. It will hold a tube rigidly in any position and at any height.

By a new arrangement of connections, the vacuum in an adjustable tube may be held at any desired point without leakage through the adjustment. This is very important, as by the older methods there was a constant leakage which tended to lower the vacuum. This same method of connection is now used on all our stands.

Floor Tube Stand, with Adjustable Spark Gap and Pair of Cords	$10.00.	Code word, Finados
Set of Cords, heavily insulated	1.00.	Code word, Finances
Small Wooden Tube Stand	2.00.	Code word, Finage



TUBE STAND

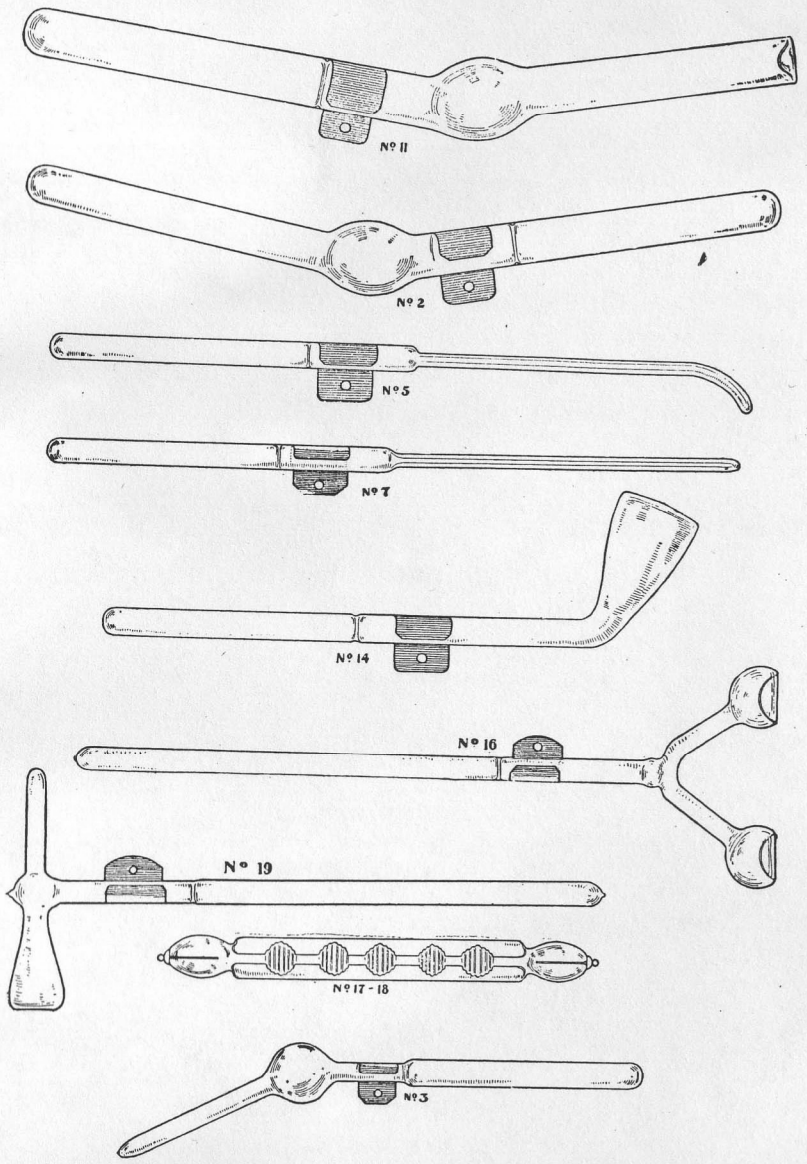
Milliamperemeter

It has but recently been possible to secure a reliable meter to measure currents of high and other frequencies. The value of an instrument of this sort must be conceded by all. For all-round work, the one illustrated is without a peer. It will record accurately the dosage on any current which a physician may wish to administer, galvanic, faradic, static, high frequency and X-Ray.

The meter has a high and a low scale, the former reading to 2500 milliamperes, and the latter to 250. The case is of beautifully finished brass, and is mounted on an oak base.

Full directions for connecting and operating accompany each instrument.

Code word, Sostegno . . . . . Price, $30.00



VACUUM ELECTRODES

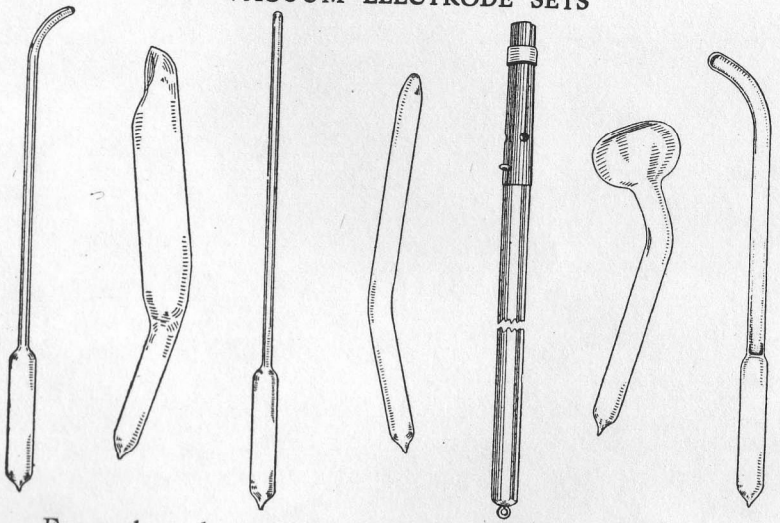
Vacuum Electrodes

These Electrodes are well and substantially made, and are highly colored. They will work on either a coil or static machine.

Electrodes Nos. 17 and 18 are especially fine in color effects. In ordering, please specify colors desired. They can be furnished in green, blue, red, or purple.

No. 14	For general application	$1.50.	Code word, Kræmerin
No. 2	For vaginal application	1.50.	Code word, Kræmpeln
No. 3	For rectal application	1.50.	Code word, Kræmpe
No. 11	For vaginal application, with cupped end	1.50.	Code word, Krænkende
No. 5	For urethral application, with curved end	1.50.	Code word, Krænker
No. 7	For urethral application, straight	1.50.	Code word, Krænklich
No. 15	For eye application	1.50.	Code word, Krænkung
No. 16	Double Eye Electrode	1.50.	Code word, Krætze
No. 19	Hammer Electrode	1.50.	Code word, Krætzig
No. 18	Geissler Electrode, for general tonic treatment	2.00.	Code word, Kourilien
No. 17	(Not so highly colored as No. 18)	2.00.	Code word, Kourgan
No. 1	For use around the spine. Shaped like a tuning fork	1.50.	Code word, Krænseln
One pair Metal Handles and Cords		1.00.	

VACUUM ELECTRODE SETS



For a cheap but substantial set for all-round use, containing all of the most used Electrodes, the one shown in the above cut is recommended.

The Electrodes are as follows:

	Handle	$1.00.	Code word, Koulbac
No. 3A	Rectal (without bulb)	1.00.	Code word, Kouler
No. 5A	Urethral, curved	1.00.	Code word, Koulougli
No. 7A	Urethral, straight	1.00.	Code word, Koumiss
No. 11A	Vaginal, with cupped end	1.00.	Code word, Koupara
No. 14A	General external work	1.00.	Code word, Koupholite
No. 20A	Eustachian	1.00.	Code word, Kourakin
Price for Set and Handle		5.00.	Code word, Koukarien

A firm insulating handle, fitted with a universal coupling, will complete the set.

Fluoroscopes

Platinum Barium Cyanide Fluoroscope, 4 x 5 (code word, Eapse)	$8.00
Platinum Barium Cyanide Fluoroscope, 5 x 7 (code word, Earshrift)	10.00
Platinum Barium Cyanide Fluoroscope, 6 x 8 (code word, Earthling)	16.00
Platinum Barium Cyanide Fluoroscope, 8 x 10 (code word, Earthly)	24.00

TERMS

Prices in this bulletin are net, except where cash accompanies order, in which case a discount of five per cent will be allowed.

In case of C. O. D. shipments, where a draft of twenty-five per cent of bill accompanies order, the same discount may be taken.

Remit by express or post-office money order or by New York draft. Add twenty-five cents to face of all checks, except on New York or Boston, to cover collection charges.

REFERENCES

Customers unknown to us must give satisfactory references, send draft with order, or we will ship C. O. D., charges for return of money to be borne by purchaser.

Goods will be delivered f. o. b. freight or express, Boston, Mass. No charge for packing. Each piece of apparatus is carefully packed and no allowance will be made for loss or breakage in transit.

Western Union Telegraph code used. Telegraph and cable address, "Swettxray."

When in Boston, we shall be glad to have you make your headquarters at our office.

DIRECTIONS FOR SETTING UP AND OPERATING

The CYCLONE COIL

SWETT & LEWIS COMPANY
18 Boylston Street, Boston, Mass.

PRESS OF
MURRAY AND EMERY COMPANY
BOSTON, MASSACHUSETTS

Bulletin Number
Thirty-eight

THE CYCLONE CABINET COIL

DON'T run the coil unless the discharge rods are in place so as to allow the current to discharge into the air.

DON'T expect the best results with the spark gap badly burned.

DON'T forget to oil the spark gap screw occasionally.

DON'T start the X-Ray tube with the spark gap open, or stop it before closing the gap.

DON'T run the coil on the direct current. It is intended for the alternating current only.

respiration, heart, and the vaso-motor system. The application here should be gentle, and continued until the skin shows a slight redness. The effects are most satisfactory.

Patients suffering from neurasthenia (resulting from overwork and worry), insomnia, etc., respond to a treatment as above described, better than any other kind of medical treatment.

For the ache of muscular rheumatism and neuritis, apply directly over the painful part, making the current sufficiently mild that it may be borne for a ten-minute application. This treatment may be repeated two or three times the same day, should the pain return.

Applied over the area of the liver, it stimulates its functions, increasing the flow of bile and the chemical change in the blood from the viscera of digestion. The high frequency current from the No. 14 electrode is a valuable adjunct in the treatment of skin diseases.

Of the special electrodes, the small eye electrode is useful in the treatment of migrame; No. 2 in toning up the vaginal glands and curing leucorrhœa; No. 11 in healing cervical erosions; No. 3 in treatment of piles and puritus ani; Nos. 5 and 7 in the treatment of urithritis.

No special couch, chair, or insulating platform is required. Any wooden chair, which does not have metal springs, may be used.

For books on high frequency treatment, see High Frequency Currents, by Chisholm Williams, price, $2.75; Currents of High Potential, of High and Other Frequencies, by William Benham Snow, price, $2.50; Elements of General Radiotherapy, by Leopold Freund, price, $5.00.

Directions for Setting Up and Operating the Cyclone Coil

Unpack carefully and see that no small parts are left in the packing material.

Assembling.

The coil is shipped assembled, and needs but unpacking and connecting to the lamp socket to be ready for use. A glance at the cut will give you a general idea of how the parts of the tube stand should be arranged. They are easily assembled by the aid of a screw-driver.

Connections.

With each coil is furnished a cord with a square connector on one end, and on the other an attaching plug, which should be screwed into the lamp socket. On the right-hand side of the cabinet will be seen three sets of pins marked, Weak, Medium, and Strong. The square connector may be slipped on any set of pins desired. On the opposite side are found two sets of holes marked, Thermo-Faradic and High Frequency, also two switch pins with hard rubber heads. These pins should be inserted in the proper pair of holes according to the current desired. In case of the thermo-faradic, the sponge or the lamp and sponge, should be attached to the binding posts directly above the holes. This arrangement differs on the Portable Coil. See Special Directions.

Special Directions for Operating the Cyclone Portable Coil.

Never lift the coil by the strap unless the top section is locked in position.

Observe that the top section is located by two rubber steady pins, one of which is much nearer the end than the other. This

is to prevent reversing and misconnection when the top section is inverted. When the top is rightly placed on the base, neither end will project. Be sure that the spring pins strike the contact plates. This they must do if the top section is properly located.

Be sure to examine the factory method of packing the small parts within the coil before disturbing their arrangement.

Place the hard rubber extension pieces in the hard rubber secondary posts by a slight twisting movement, then slip the discharge rods over the pins on the top of these extension pieces. Never run a coil unless the discharge rods are in place just as described, otherwise it will be damaged. To remove the extension pieces, lift and rock them. Do not try to twist them out, as that is likely to set them more firmly.

The arrangement of the tube stand can readily be ascertained from the illustration. This stand is necessarily small and should not be abused. It will be seen that a little pressure on the wing nuts will firmly hold the small parts. Too much pressure should not be used. If adjustment is desired, be sure to slack off the nuts first and do not try to force into position.

The pin switching device will be found inside of the base in the end opposite the spark gap. If both switch pins with the hard rubber heads are placed in the holes marked High Frequency, the secondaries will be excited, if they are in the proper position as before mentioned.

X-Ray.

First be sure that the main switch is off or the square connector disconnected from the pins and the spark gap closed. Place the tube in the stand and connect as per diagram. Slip the small adjusting handle with ball on end No. 20 over the wire No. 21, in such a position that it may easily be brought up to ball No. 15. Have the gap at A open from 2½ to 3 inches. Connect wires No. 21 and No. 22 to the rings in the pole pieces of coil Place the square connector over the proper pair of pins: Strong, if powerful effects are desired; Medium, if weaker. Turn the switch to ON. Then open the spark gap gradually until the desired effect is

are of a peculiar character and capable of producing blisters. They can be easily avoided by moving the sponges around, keeping always in contact with the flesh, and by closing the spark gap before removing them. If less current is used, the heat effect disappears, the current becomes markedly faradic in its character but possesses great smoothness on account of the enormous frequency and perfectly steady oscillations.

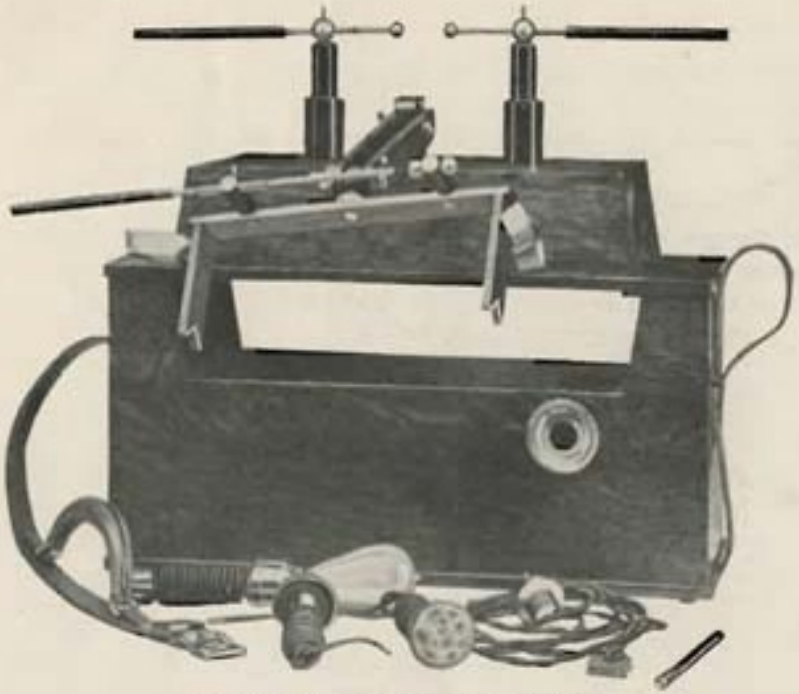
Vacuum Electrode Effects.

Attach one end of the insulated wire to the electrode, the other to one of the pole pieces. One pole only may be used, or the patient may be connected in circuit by holding in one hand a glass or metal electrode attached to the opposite pole, while the other electrode is applied by the operator. Start with the spark gap closed and the square connector on Weak or Medium. Increase current as desired by opening the spark gap. The operator applies the electrode with one hand, using the other to hold the wire aloof from the patient, by means of an insulated handle.

The electrodes may be applied directly in contact with the skin, which produces a sensation of mere warmth, or held at a little distance, when a spray or sparks are delivered according to strength of current. Electrode No. 14 may be applied equally well through the clothing. Hairpins, or articles of clothing containing metal, etc., must be removed for local application to the parts. The amount of insulation of the clothing varies so much that it must be determined for each individual case.

The discharge from the electrodes can be varied from a bare sensation of warmth to painful sparks. This may be accomplished by the adjustment of the spark gap, and if a mild application is desired, by inserting a No. 17 or No. 18 electrode in the middle of the wire to which the operator's electrode is attached.

No. 14 electrode, with moderate current applied in a general treatment over arms, legs, and body, produces a general tonic effect, bringing the blood to the surface, and by causing gentle muscular contractions enhances cell metabolism. A favorite application for tonic treatment is over the medulla, the great nerve centre of

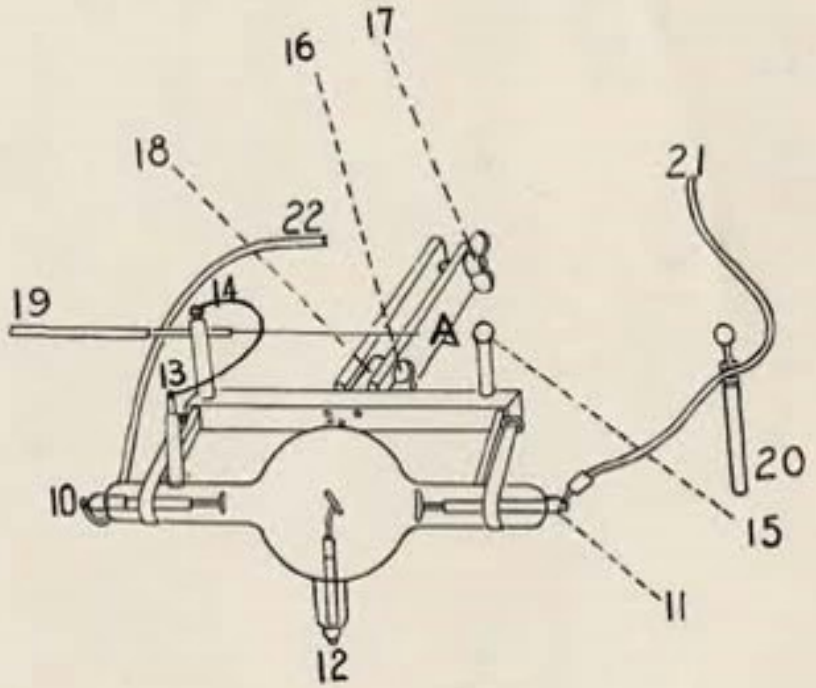


THE CYCLONE PORTABLE COIL — OPEN

THE CYCLONE PORTABLE COIL — CLOSED

obtained from the tube. In working either an X-Ray tube or vacuum electrode, the switch pins must always be in hole marked High Frequency.

Should the vacuum in the tube be too high, bring handle No. 20 up to ball No. 15, and allow it to remain in contact as long as sparks pass across at A. When they cease, the tube will be found low enough. Shortening the distance at A in connection with



handle No. 20 will lower the vacuum, lengthening it will raise the vacuum.

To obtain a maximum X-Ray effect, the spark gap should be opened gradually until just before it ceases to operate. If the sparking at the gap stops, turn it back until it begins again, then open once more as far as possible. Perfect control may be obtained by the spark gap and by moving the square connector to the dif-

ferent sets of regulating pins. Anything between the smallest and the largest amount of current may readily be obtained.

A space of about three inches will give a high vacuum, or hard tube; a space of one inch, a low vacuum, or soft tube, etc.

Never allow gap A to be closed while the coil is running, for if it is, too much gas will be driven off, bringing the vacuum too low for X-Ray purposes. Should an accident of this sort happen, put the tube away for a week or two, and after that time the gas will probably have been reabsorbed. The vacuum may be raised by running the tube until the anode becomes red, then resting it for a few minutes, then running again until the anode reddens. If this is repeated a few times and the tube allowed to rest for an hour or longer, it is usually high enough for all purposes.

A brief explanation will make the adjusting apparatus clear. Electricity always travels by the easiest course; it will, therefore, go through the tube if the vacuum is not too high, but if it is too high, it will travel by the course A. This sends sparks through the chemical bulb, No. 13, liberating gas. This continues till the vacuum is lowered to a point where the current resumes its passage through the tube.

The electrodes of the spark gap can easily be unscrewed by the fingers or plyers, and may be polished by rubbing on a piece of sand or emery paper. A little brightening once in a while will improve the running of the coil. An extra pair of electrodes is furnished with each coil and will be found sufficient for months of continuous work.

When running the tube or electrodes, the cords carrying the current must not touch the woodwork near the secondary posts. The cords should be at least one inch or more away from the woodwork. If they are loosely knotted this may be accomplished with ease.

Milliampere meter.

Place the milliampere-meter on some convenient support. If the instrument is set on the top of the coil, it should be placed on a thick piece of felt or a magazine so as to raise it from the woodwork. Connect by means of a short cord with one pole piece and with one binding post. From the other binding post on the meter run a cord to the vacuum electrodes, or wire No. 22, to the X-Ray tube.

When using the thermo-faradic, run the short cord to one of the thermo-faradic binding posts, and connect to the other binding post as usual. To the second meter post, attach the cord running to either the lamp or sponge. On the thermo-faradic, use only the high scale or the meter may be injured.

Thermo-Faradic Effects.

In starting, see that the switch pins are in holes marked Thermo-Faradic, that the spark gap is closed and that the square connector is on pins marked Weak or Medium, according to whether mild or strong currents are desired.

In starting, always open the spark gap slowly, and in stopping, always close before removing the electrode from the patient.

Thoroughly wet sponges, or other electrodes, should be attached to the thermo-faradic binding posts and applied as may be desired to the patient. Two currents of markedly different character may be obtained and changed at will by means of the spark gap or regulating pins. If the full current is used with an exceedingly small spark gap increasing from mere nothing until the current becomes painful to the patient, and properly graduated, no electrical sensation will be felt. A sensation of heat will be produced under and at a considerable distance from the sponges, one of which generally becomes hotter than the other. If too much spark gap and current are used this heat will soon become unbearable. If it is desired, the current may be sent to the patient by means of the incandescent lamp, and a sponge used for its return. By this means, the filament of the lamp is in series with the patient, and will glow to a greater or less extent according to the current received. It is not difficult to bear, for a short time, a current of sufficient strength to bring the lamp to full brilliancy. With the spark-gap open, the current will be strong, and some sparks will be noticed on applying or removing the sponges. These sparks

Bulletin Thirty-Nine

Electro-Radiation Company

SUCCEEDING SWETT & LEWIS COMPANY

MANUFACTURERS OF

High Frequency X-Ray and Electro-Medical Apparatus

18 BOYLSTON STREET, BOSTON, MASS.

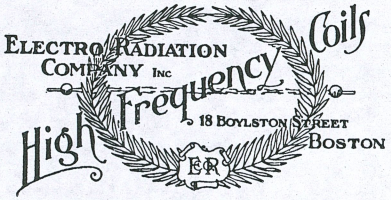
Bulletin No. 39

ELECTRO-RADIATION COMPANY

SUCCEEDING SWETT & LEWIS COMPANY

IT is with pleasure that we announce the purchase of the business carried on for many years by the Swett & Lewis Company. The office and factory equipments of both companies have been merged and give us unsurpassed facilities. The previous high standard of our apparatus will be maintained. We are the sole manufacturers of the electro-therapeutic apparatus designed by Dr. Frederick F. Strong and by Mr. Thomas B. Kinraide.

Prospective purchasers are warned against infringements.



Office and Warerooms:

18 BOYLSTON STREET, BOSTON, MASSACHUSETTS

Factory: 287 ATLANTIC AVENUE

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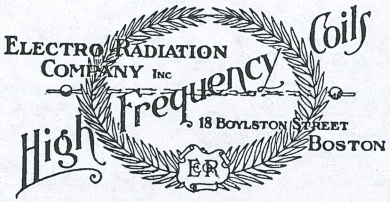

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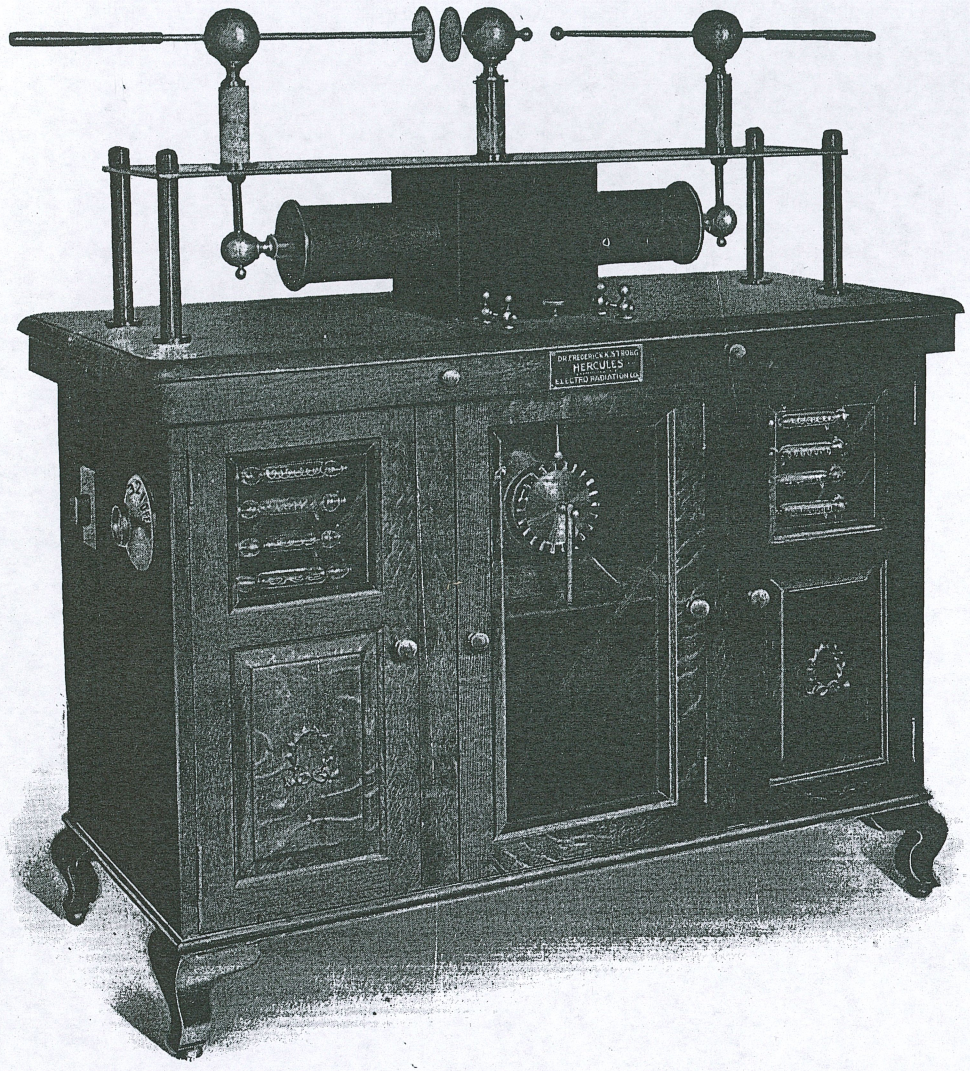


The Hercules

PRICES

THE HERCULES COIL. Code word, Hermann.	For the alternating current	$450.00
THE HERCULES COIL. Code word, Hermanric.	For the 110-volt direct current	$520.00

The Hercules Coil

The cabinets of these machines are made of oak, panelled o sides, with French plate-glass doors in front. Two banks of h colored Geissler electrodes are placed one on each side of the ce glass panel, for demonstration and experimental purposes. The sp gap occupies the central compartment behind the glass; the light this can be shut off by a velvet curtain if desired. The high-te coil is mounted on the top of the cabinet, and is entirely enclose hard rubber; above this, supported by four heavy pillars, is a of plate-glass, which in turn supports the three massive terminals, w are mounted upon pedestals of selected Mexican onyx. The rubber knob by which the spark-gap is regulated is conveniently loc in the centre and near the front of the cabinet. Connecting post provided, by which the high-tension coil can be thrown entirely o the circuit, and the machine can then be used, if desired, to operate make of Solenoid or Resonator.

PRICES

OUTFIT NO. 201. For the alternating current.
Code word, Hermanubis.

One Hercules Coil			$4
One Platinum Barium Cyanide Fluoroscope, 5 x 7	$10.00	With this outfit only	
One Tube Stand	10.00		
One Type H. F. X-Ray Tube	14.00		
One set of Vacuum Electrodes	5.00		
One Ultra Violet Lamp	15.00		
	$54.00		
			$5

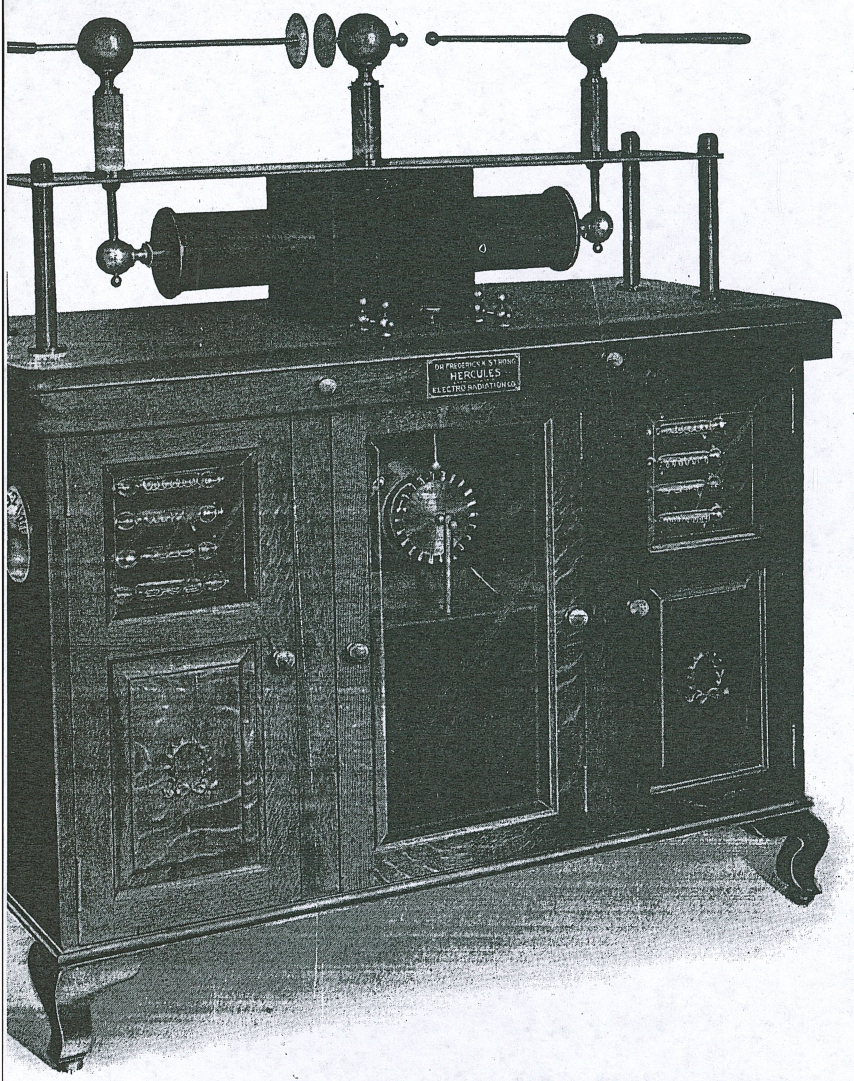
OUTFIT NO. 202. For 110-volt direct current.
Code word, Hermanar.

Same as enumerated in Outfit No. 201	$5
Rotary Converter	
	$5

For 220-volt direct current, add $20.00 to the above.

OUTFIT NO. 203. For the alternating current.
Code word, Hermanaron.

One Hercules Coil	$4
One 8 x 10 Silicate Fluoroscope	
Two X type X-Ray Tubes	
One Tube Stand	
One set of Vacuum Electrodes	
Ten pounds X-Ray Foil	
One High Frequency Milliamperemeter	
Two Mineral Tubes	
One Ultra Violet Lamp	
One Cautery Attachment	
One Handle and Snare	
Eight Cautery Knives	
One pair Cautery Cords	
	$60



The Hercules

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HERCULES COIL. e word, Hermanric.	For the 110-volt direct current	$520.00

The Hercules Coil

The cabinets of these machines are made of oak, panelled on all sides, with French plate-glass doors in front. Two banks of highly colored Geissler electrodes are placed one on each side of the central glass panel, for demonstration and experimental purposes. The spark-gap occupies the central compartment behind the glass; the light from this can be shut off by a velvet curtain if desired. The high-tension coil is mounted on the top of the cabinet, and is entirely enclosed in hard rubber; above this, supported by four heavy pillars, is a table of plate-glass, which in turn supports the three massive terminals, which are mounted upon pedestals of selected Mexican onyx. The hard rubber knob by which the spark-gap is regulated is conveniently located in the centre and near the front of the cabinet. Connecting posts are provided, by which the high-tension coil can be thrown entirely out of the circuit, and the machine can then be used, if desired, to operate any make of Solenoid or Resonator.

PRICES

OUTFIT NO. 201. For the alternating current.
Code word, Hermanubis.

One Hercules Coil			$450.00
One Platinum Barium Cyanide Fluoroscope, 5 x 7	$10.00	With this outfit only	50.00
One Tube Stand	10.00		
One Type H. F. X-Ray Tube	14.00		
One set of Vacuum Electrodes	5.00		
One Ultra Violet Lamp	15.00		
	$54.00		
			$500.00

OUTFIT NO. 202. For 110-volt direct current.
Code word, Hermanar.

Same as enumerated in Outfit No. 201	$500.00
Rotary Converter	70.00
	$570.00

For 220-volt direct current, add $20.00 to the above.

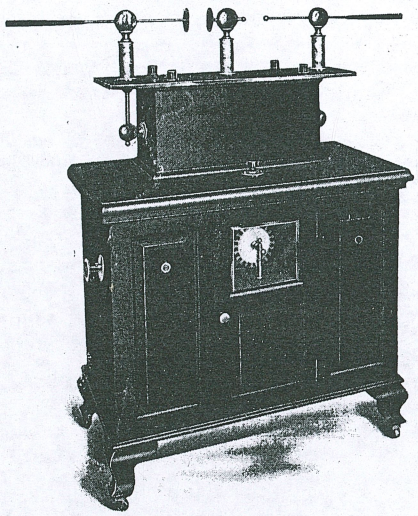
OUTFIT NO. 203. For the alternating current.
Code word, Hermanaron.

One Hercules Coil	$450.00
One 8 x 10 Silicate Fluoroscope	14.00
Two X type X-Ray Tubes	34.00
One Tube Stand	10.00
One set of Vacuum Electrodes	5.00
Ten pounds X-Ray Foil	2.50
One High Frequency Milliamperemeter	30.00
Two Mineral Tubes	6.00
One Ultra Violet Lamp	15.00
One Cautery Attachment	25.00
One Handle and Snare	6.00
Eight Cautery Knives	6.00
One pair Cautery Cords	1.50
	$605.00

OUTFIT NO. 204. For the 110-volt direct current.
Code word, Hermandad.

Same as enumerated in Outfit 203	$605.00
Rotary Converter	70.00
	$675.00

For the 220-volt direct current, add $20.00 to the above.



The Hercules Special Coil

PRICES

THE HERCULES SPECIAL COIL. For the alternating current $350.00
Code word, Hypogyne.

THE HERCULES SPECIAL COIL. For the 110-volt direct current .. $420.00
Code word, Hypogynous.

The Hercules Special Coil

The only difference between this machine and the "Hercules" lies in the cabinet, which is smaller and less elaborate. The machine has exactly the same parts, power and efficiency. The cabinet is finely finished and of quartered oak. The terminals are supported on onyx columns, mounted on heavily polished plate-glass. The spark-gap is in a compartment by itself and is readily accessible.

PRICES

OUTFIT NO. 226. For the alternating current.
Code word, Hypohema.

One Hercules Special Coil			$350.00
One Platinum Barium Cyanide Fluoroscope, 5 x 7	$10.00	When purchased with this outfit	50.00
One Tube Stand	10.00		
One Type H. F. X-Ray Tube	14.00		
One set of Vacuum Electrodes	5.00		
One Ultra Violet Lamp	15.00		
	$54.00		$400.00

OUTFIT NO. 227. For the 110-volt direct current.
Code word, Hypoiastia.

Same as enumerated in Outfit No. 226	$4
Rotary Converter	
	$4

For the 220-volt direct current, add $20.00 to the above.

OUTFIT NO. 228. For the alternating current.
Code word, Hylithe.

One Hercules Special	$3
One 5 x 7 Silicate Fluoroscope	
One X type X-Ray Tube	
One Type H. F. X-Ray Tube	
One Tube Stand	
One set of Vacuum Electrodes	
One Ultra Violet Lamp	
Eight pounds X-Ray Foil	
Six No. 17 and No. 18 Electrodes, highly colored	
One High Frequency Milliamperemeter	
	$4

OUTFIT NO. 229. For the 110-volt direct current.
Code word, Hyllos.

Same as enumerated in Outfit 228	$4
Rotary Converter	
	$5

For the 220-volt direct current, add $20.00 to the above.

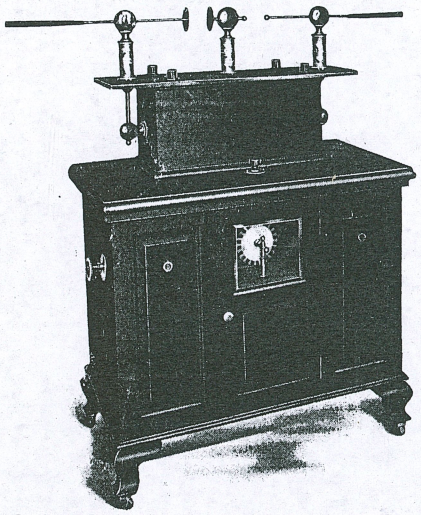
The Junior Coil

In response to the many demands for a portable high freque outfit, Dr. Strong has designed the apparatus shown in the illustrat The case is of nicely finished mahogany, with a stout handle, so tha can be readily carried. The battery is a special storage equipm which will run for a large number of treatments. There is a v simple stationary spark-gap included, which is easily regulated runs with great smoothness. The whole outfit is really one of larger coils in miniature. It is specially adapted for the opera of vacuum electrodes and for giving the faradic and sinusoidal curre It is especially useful in bedside cases. There is no portable ap atus on the market which will begin to give the volume of current the great range that will this coil. Included in the price is a se vacuum electrodes, together with a highly colored Geissler electr The storage batteries can be charged at any automobile or elec power station. When discharged, a battery may be forwarded to express paid, and exchanged for a new one. The exchange price ($2. must, in each instance, accompany the order.

'IT NO. 204. For the 110-volt direct current.
e word, Hermandad.

as enumerated in Outfit 203	$605.00
y Converter	70.00
	$675.00

the 220-volt direct current, add $20.00 to the above.



The Hercules Special Coil

PRICES

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HERCULES SPECIAL COIL. For the 110-volt direct current ..	$420.00
e word, Hypogynous.	

The Hercules Special Coil

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PRICES

'IT NO. 226. For the alternating current.
le word, Hypohema.

Hercules Special Coil			$350.00
'latinum Barium Cyanide Fluoroscope, 5 x 7 ...	$10.00	When purchased with this outfit	50.00
'ube Stand	10.00		
'ype H. F. X-Ray Tube	14.00		
et of Vacuum Electrodes	5.00		
Jltra Violet Lamp	15.00		
	$54.00		$400.00

OUTFIT NO. 227. For the 110-volt direct current.
Code word, Hypoiastia.

Same as enumerated in Outfit No. 226	$400.00
Rotary Converter	70.00
	$470.00

For the 220-volt direct current, add $20.00 to the above.

OUTFIT NO. 228. For the alternating current.
Code word, Hylithe.

One Hercules Special	$350.00
One 5 x 7 Silicate Fluoroscope	7.00
One X type X-Ray Tube	17.00
One Type H. F. X-Ray Tube	14.00
One Tube Stand	10.00
One set of Vacuum Electrodes	5.00
One Ultra Violet Lamp	15.00
Eight pounds X-Ray Foil	2.00
Six No. 17 and No. 18 Electrodes, highly colored	10.00
One High Frequency Milliamperemeter	30.00
	$460.00

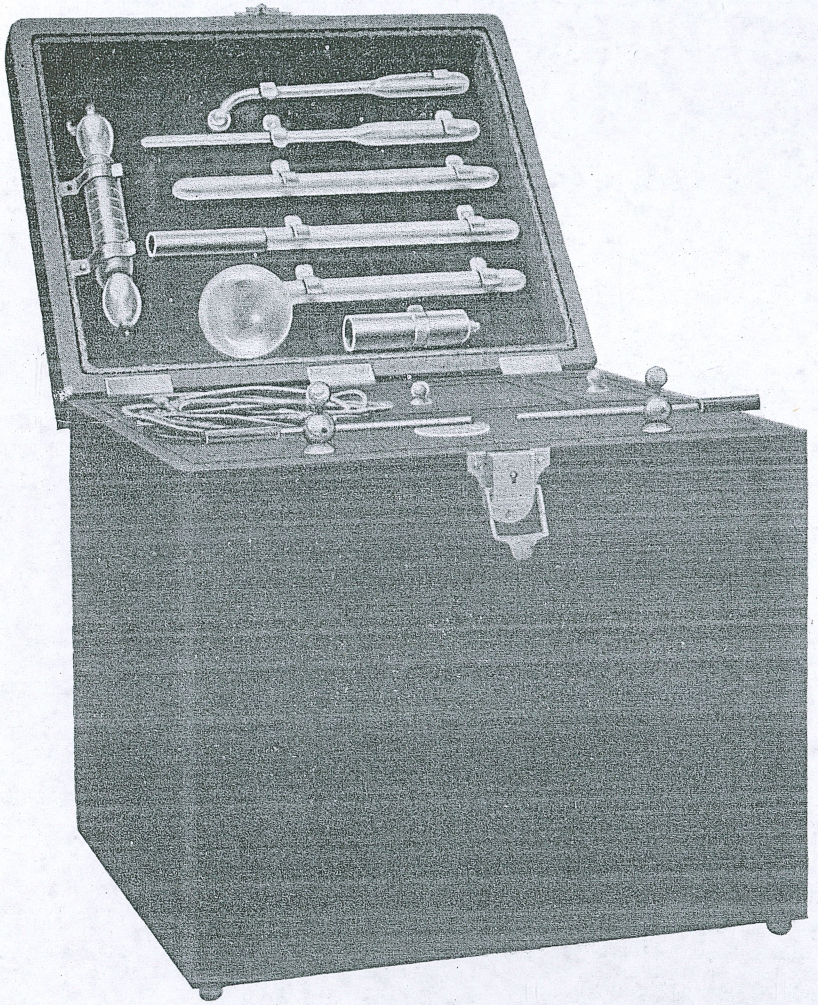
OUTFIT NO. 229. For the 110-volt direct current.
Code word, Hyllos.

Same as enumerated in Outfit 228	$460.00
Rotary Converter	70.00
	$530.00

For the 220-volt direct current, add $20.00 to the above.

The Junior Coil

In response to the many demands for a portable high frequency outfit, Dr. Strong has designed the apparatus shown in the illustration. The case is of nicely finished mahogany, with a stout handle, so that it can be readily carried. The battery is a special storage equipment which will run for a large number of treatments. There is a very simple stationary spark-gap included, which is easily regulated and runs with great smoothness. The whole outfit is really one of the larger coils in miniature. It is specially adapted for the operation of vacuum electrodes and for giving the faradic and sinusoidal currents. It is especially useful in bedside cases. There is no portable apparatus on the market which will begin to give the volume of current and the great range that will this coil. Included in the price is a set of vacuum electrodes, together with a highly colored Geissler electrode. The storage batteries can be charged at any automobile or electric power station. When discharged, a battery may be forwarded to us, express paid, and exchanged for a new one. The exchange price ($2.25) must, in each instance, accompany the order.



The Junior Portable High Frequency Coil

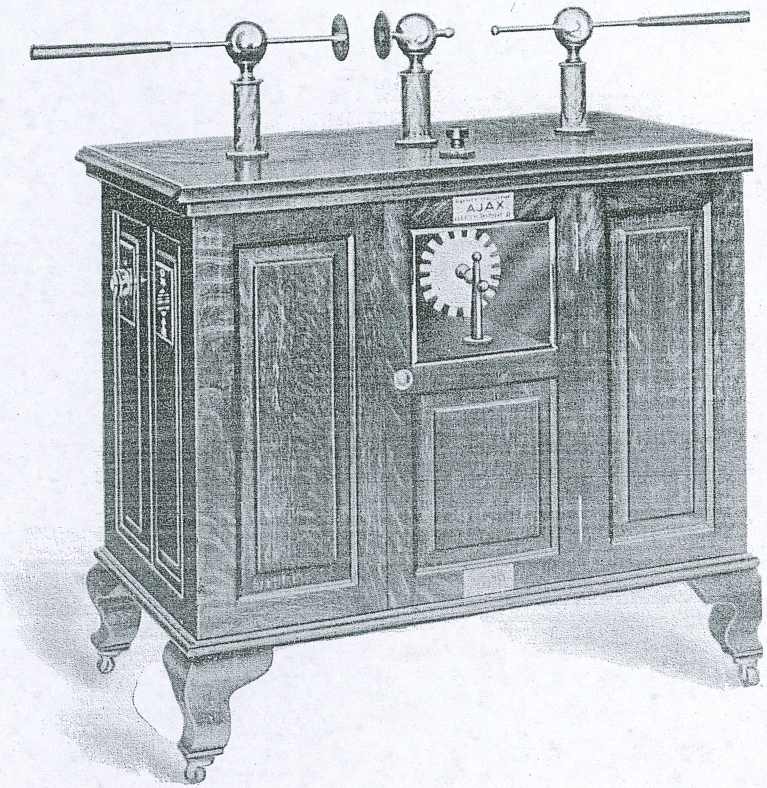
The only portable Tesla apparatus ever offered to the profession which operates on its own battery power.

PRICES

With special set of vacuum electrodes, hand, Geissler electrode and cords, complete with battery $100.00
Code word, Impious.

Extra battery in case $20.00
Code word, Impiously.

Recharging or exchange of battery $2.25
For recharging or exchange of batteries cash must accompany order.

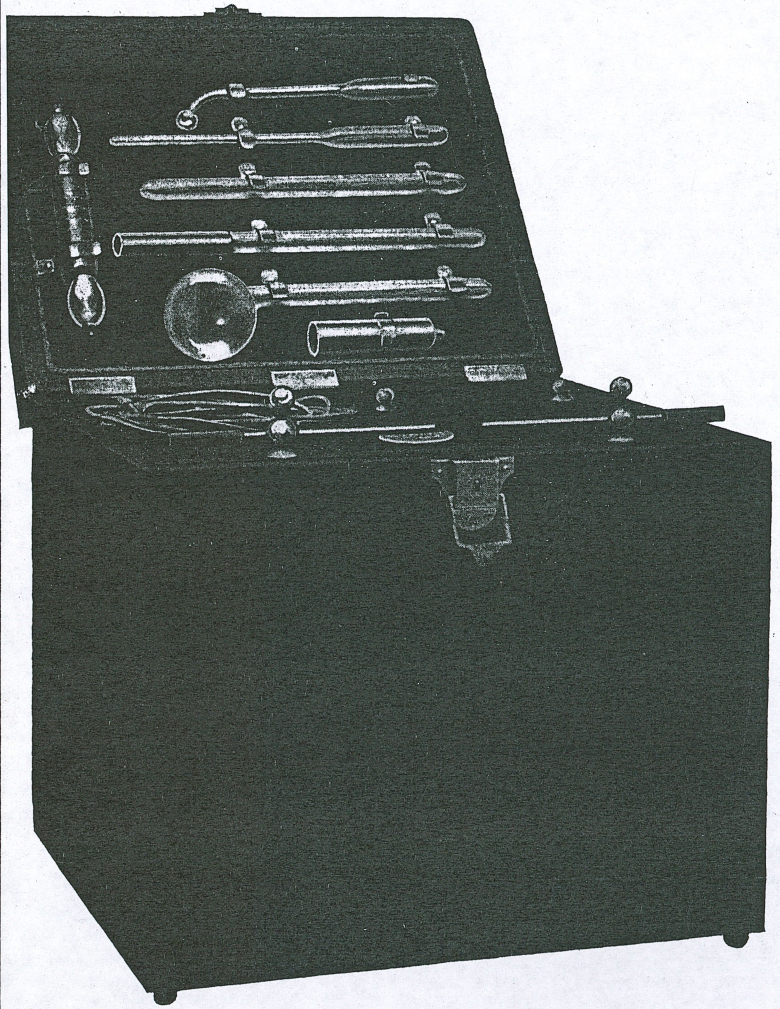


The Ajax Coil

PRICES

THE AJAX COIL. For the alternating current $2
Code word, Turquinos.

THE AJAX COIL. For the 110-volt direct current $2
Code word, Turquoise.



The Junior Portable High Frequency Coil

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PRICES

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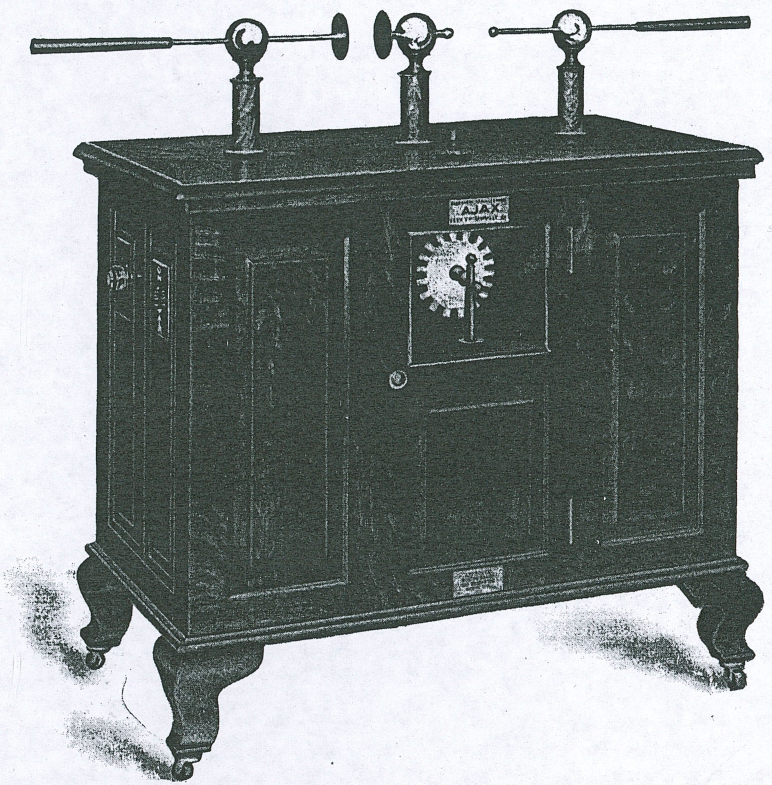
battery in case $20.00
e word, Impiously.

rging or exchange of battery $2.25
recharging or exchange of batteries cash must accompany order.



The Ajax Coil

PRICES

THE AJAX COIL. For the alternating current $200.00
Code word, Turquinos.

THE AJAX COIL. For the 110-volt direct current $250.00
Code word, Turquoise.

The Ajax Coil

This coil is designed primarily for the high-frequency work where the vacuum electrodes, spark and faradic effects are desired. It runs perfectly and is a very satisfactory coil. The cabinet work is of quartered oak, as in all the other coils of our manufacture. The high-potential coil is mounted inside of the cabinet instead of on the top, as in the case of the "Hercules." The terminals are brought up through three onyx pillars. The regulation is easily accomplished. The coils run very smoothly and give a splendid discharge. For treatment this coil is unexcelled. The price is reasonable and the machine is a handsome instrument.

PRICES

OUTFIT NO. 251. For the alternating current.
Code word, Turquesco.

One Ajax Coil			$200.00
One Platinum Barium Cyanide Fluoroscope, 5 x 7	$10.00	When purchased with this outfit	35.00
One Tube Stand	10.00		
One Type H. F. X-Ray Tube	14.00		
One set of Vacuum Electrodes	5.00		
	$39.00		
			$235.00

OUTFIT NO. 252. For the 110-volt direct current.
Code word, Turquet.

Same as enumerated in Outfit No. 251	$235.00
Rotary Converter	50.00
	$285.00

For the 220-volt direct current, add $20.00 to the above.

OUTFIT NO. 253. For the alternating current.
Code word, Turpitude.

One Ajax Coil	$200.00
One 5 x 7 Silicate Fluoroscope	7.00
One Tube Stand	10.00
Two H. F. X-Ray Tubes	28.00
One set of Vacuum Electrodes	5.00
Two No. 17 and No. 18 Electrodes, highly colored	4.00
One High Frequency Milliamperemeter	30.00
Four pounds X-Ray Foil	1.00
	$285.00

OUTFIT NO. 254. For the 110-volt direct current.
Code word, Turquerie.

Same as enumerated in Outfit No. 253	$285.00
Rotary Converter	70.00
	$355.00

For the 220-volt direct current, add $20.00 to the above.

The Jackson Coil

The Jackson Coil is designed to give a very powerful effe breeze discharge, rivaling even that of a Static machine. Whi giving a true uni-directional Static Current, the therapeutic obtainable from a Static can be produced.

The coil may be connected direct to any commercial sou electricity. It is not affected by moisture or climatic changes. always available for use. There is no complicated, troublesom expensive interrupter. The simple spark-gap used is absolutely re It can be set to give any output desired, and the coil may be run i nitely without adjustment or attention.

The illustration shows the coil having in combination with ultra-violet and cautery attachments. The cabinet is of handsome tered oak. The secondaries are mounted on a portable stand all them to be brought near to or directly over the patient, thereby pre ing leakage or loss of current, it being a well-known fact that cu of extremely high frequency cannot be readily transmitted th a wire without great loss.

All the various high frequency currents are obtainable, the ef the spark, the spray, the discharge from vacuum electrodes, the fa thermo-faradic and D'Arsonval. In addition, a very powerful violet lamp may be added. A cautery transformer may be incl which is capable of heating the heaviest knife.

Another form of this coil is shown on page 11.

The interior and the effects obtainable are the same in each the only difference between the coils being in the cabinet. T made of quartered oak and is a very imposing piece of office furn Where the alternating current is used, the drawer and closet sho the base may be used for storage purposes, as none of the working are contained therein. With each special coil, the electrodes s in the cut are furnished, but the X-ray tube is not included. For venience in shipping, the cabinet is built in two sections. The s gap, rheostat and controlling switches are conveniently located.

The Jackson Coil, while not intended as an X-ray machine, w good work in a reasonable length of time on the thinner portions c body.

PRICES.

JACKSON HIGH FREQUENCY COIL. To run on any alternating current from 52 to 250 volts and any commercial cycle, complete. including electrodes, stand and tube holder ..... $
Code word, Heidengeld.

JACKSON HIGH FREQUENCY COIL. For 110 volts direct current, as above, including rotary converter $4
Code word, Headledge.

JACKSON HIGH FREQUENCY COIL. For 220 volts direct current, as above, including rotary converter $4
Code word, Heenkomen.

CAUTERY. Additional ..... $
Code word, Curtelasse.

ULTRA VIOLET ATTACHMENT. Including lamp, cable and arm for tube stand ..... $
Code word, Conjunctum.

The Ajax Coil

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PRICES

OUTFIT NO. 251. For the alternating current.
Code word, Turquesco.

Ajax Coil			$200.00
Platinum-Barium Cyanide Fluoroscope, 5 x 7	$10.00	When purchased with this outfit	35.00
Tube Stand	10.00		
Type H. F. X-Ray Tube	14.00		
Set of Vacuum Electrodes	5.00		
	$39.00		
			$235.00

OUTFIT NO. 252. For the 110-volt direct current.
Code word, Turquet.

As enumerated in Outfit No. 251	$235.00
Rotary Converter	50.00
	$285.00

For the 220-volt direct current, add $20.00 to the above.

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Tube Stand	10.00
H. F. X-Ray Tubes	28.00
Set of Vacuum Electrodes	5.00
No. 17 and No. 18 Electrodes, highly colored	4.00
High Frequency Milliamperemeter	30.00
Pounds X-Ray Foil	1.00
	$285.00

OUTFIT NO. 254. For the 110-volt direct current.
Code word, Turquerie.

As enumerated in Outfit No. 253	$285.00
Rotary Converter	70.00
	$355.00

For the 220-volt direct current, add $20.00 to the above.

The Jackson Coil

The Jackson Coil is designed to give a very powerful effeuve or breeze discharge, rivaling even that of a Static machine. While not giving a true uni-directional Static Current, the therapeutic effects obtainable from a Static can be produced.

The coil may be connected direct to any commercial source of electricity. It is not affected by moisture or climatic changes. It is always available for use. There is no complicated, troublesome and expensive interrupter. The simple spark-gap used is absolutely reliable. It can be set to give any output desired, and the coil may be run indefinitely without adjustment or attention.

The illustration shows the coil having in combination with it the ultra-violet and cautery attachments. The cabinet is of handsome quartered oak. The secondaries are mounted on a portable stand allowing them to be brought near to or directly over the patient, thereby preventing leakage or loss of current, it being a well-known fact that currents of extremely high frequency cannot be readily transmitted through a wire without great loss.

All the various high frequency currents are obtainable, the effeuve, the spark, the spray, the discharge from vacuum electrodes, the faradic, thermo-faradic and D'Arsonval. In addition, a very powerful ultra-violet lamp may be added. A cautery transformer may be included, which is capable of heating the heaviest knife.

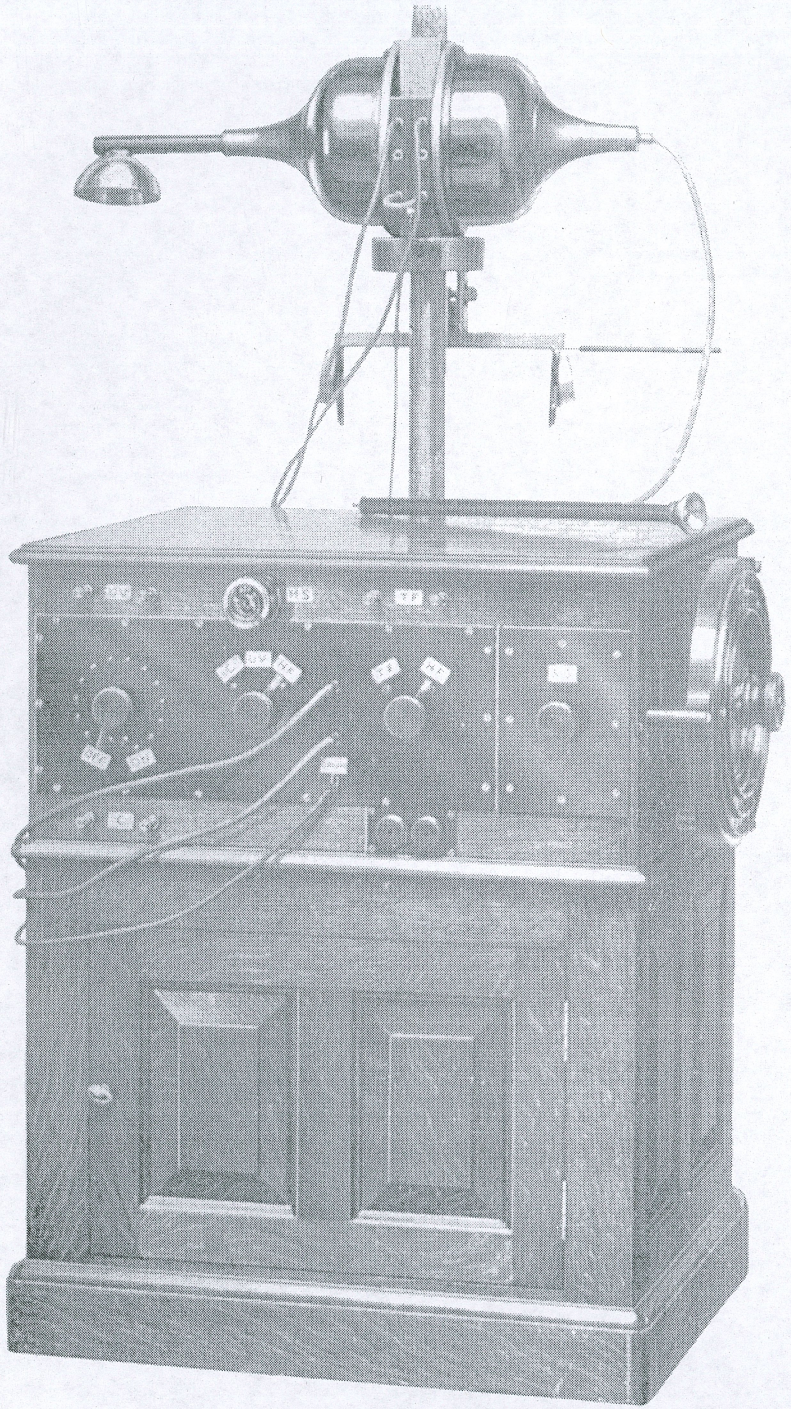
Another form of this coil is shown on page 11.

The interior and the effects obtainable are the same in each style, the only difference between the coils being in the cabinet. This is made of quartered oak and is a very imposing piece of office furniture. Where the alternating current is used, the drawer and closet shown in the base may be used for storage purposes, as none of the working parts are contained therein. With each special coil, the electrodes shown in the cut are furnished, but the X-ray tube is not included. For convenience in shipping, the cabinet is built in two sections. The spark-gap, rheostat and controlling switches are conveniently located.

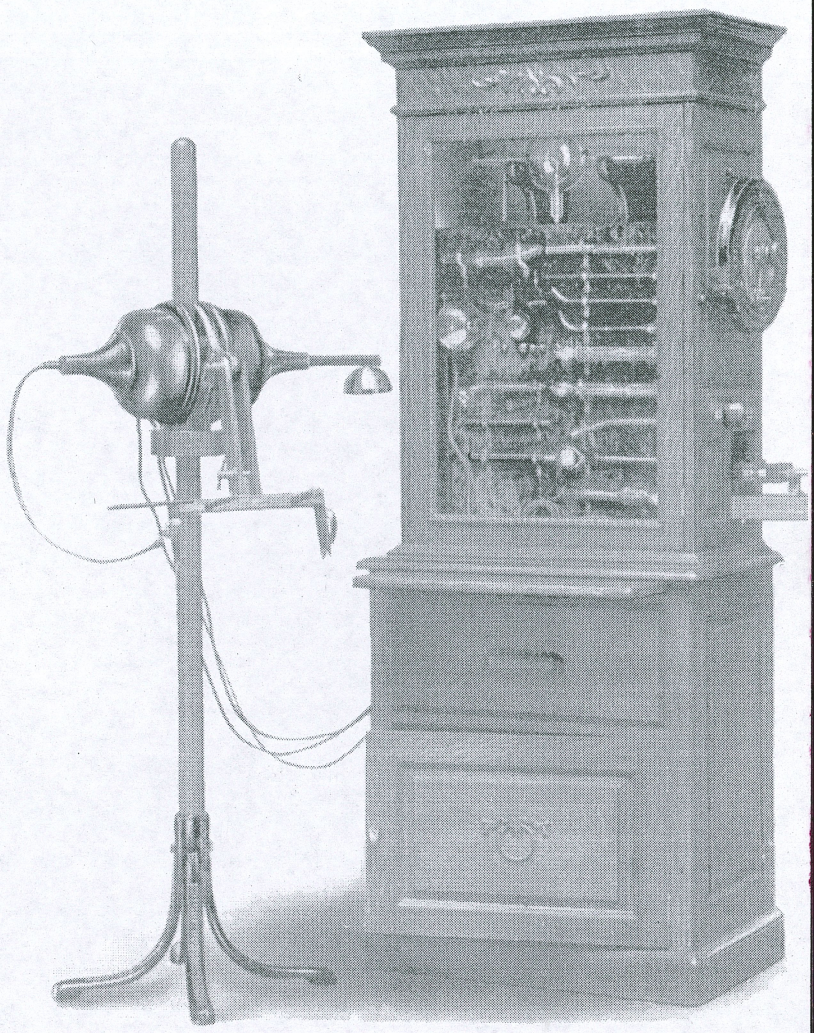
The Jackson Coil, while not intended as an X-ray machine, will do good work in a reasonable length of time on the thinner portions of the body.

PRICES.

JACKSON HIGH FREQUENCY COIL. To run on any alternating current from 52 to 250 volts and any commercial cycle, complete, including electrodes, stand and tube holder Code word, Heidengeld.	$350.00
JACKSON HIGH FREQUENCY COIL. For 110 volts direct current, as above, including rotary converter Code word, Headledge.	$420.00
JACKSON HIGH FREQUENCY COIL. For 220 volts direct current, as above, including rotary converter Code word, Heenkomen.	$440.00
CAUTERY. Additional Code word, Curtelasse.	$25.00
ULTRA VIOLET ATTACHMENT. Including lamp, cable and arm for tube stand Code word, Conjunctum.	$60.00



The Jackson Coil



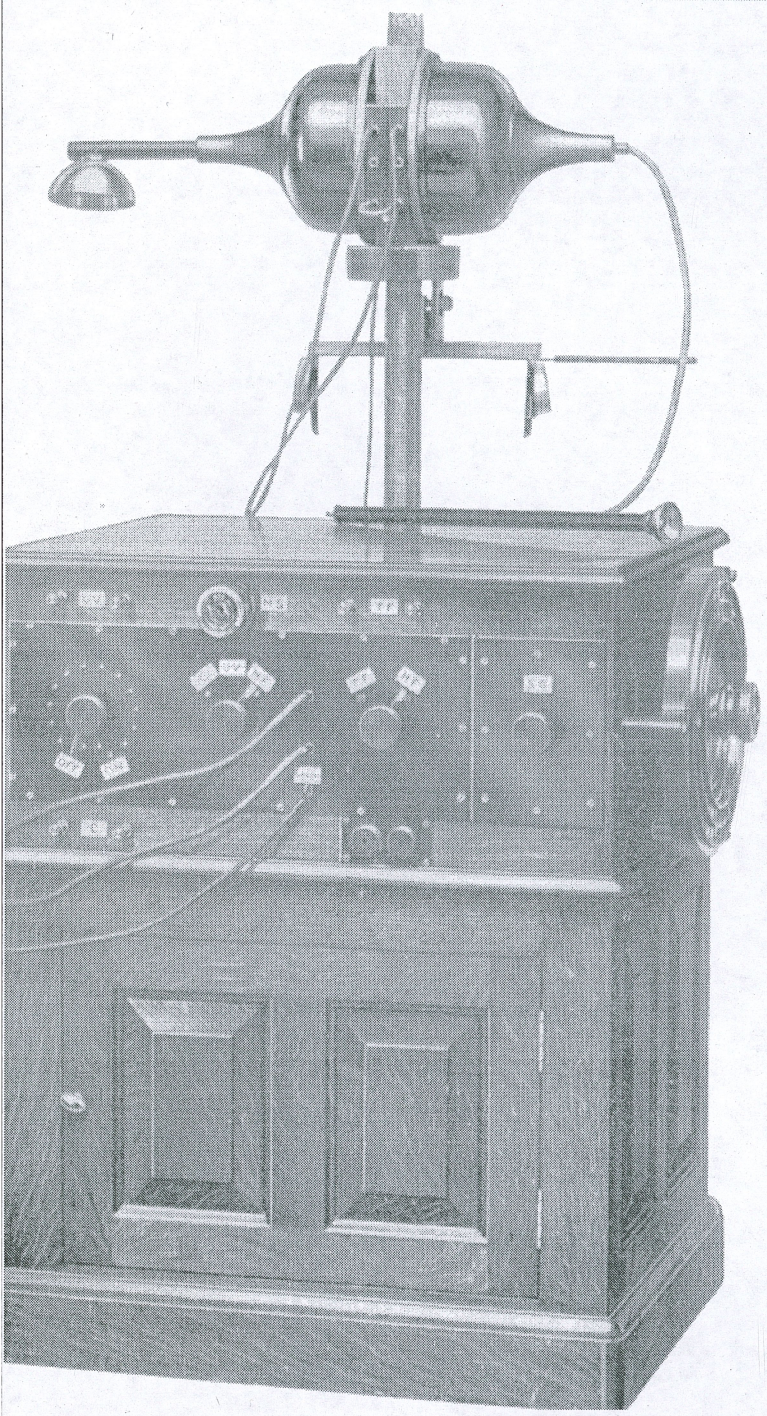
The Jackson Special Coil

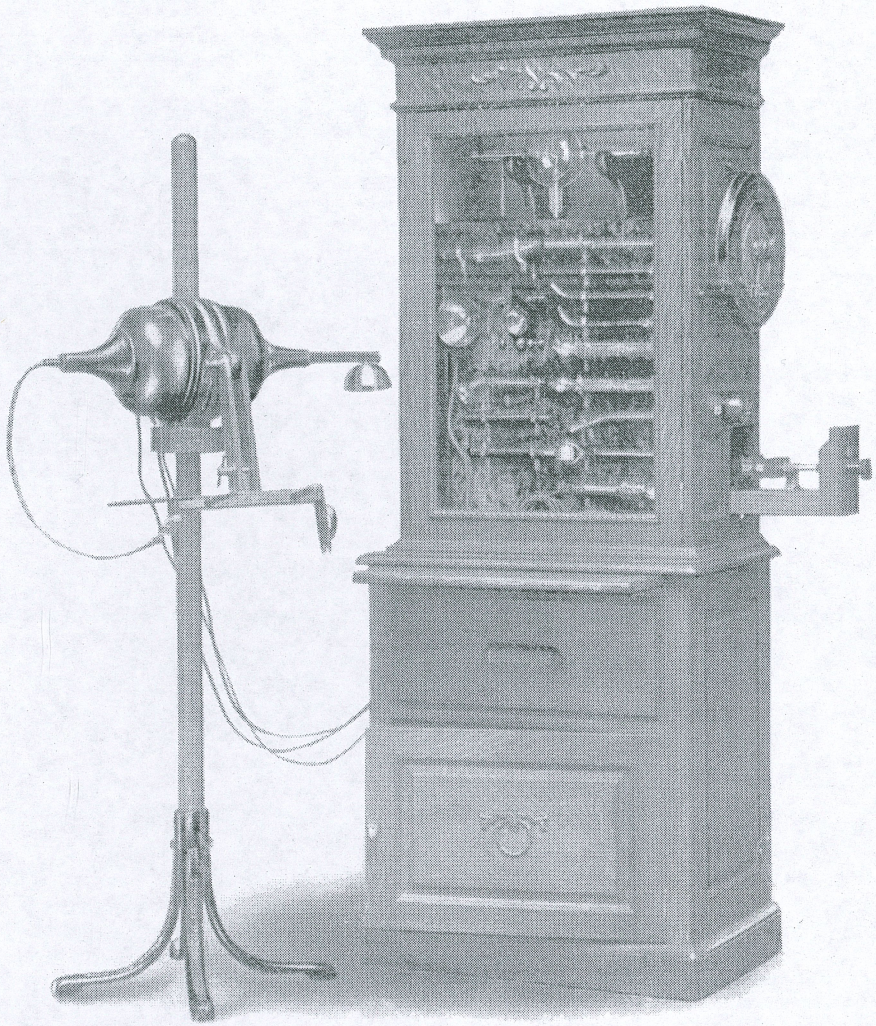
PRICES

JACKSON SPECIAL COIL. Shown in cut, including all electrodes, cords, and tube stand, for alternating current $3
Code word, Kaiserhut.

JACKSON SPECIAL COIL. For 110 volts, direct current, as above, including rotary converter $4
Code word, Kaiserin.

JACKSON SPECIAL COIL. For 220 volts, direct current, as above, including rotary converter $4
Code word, Kaiserling.





The Jackson Special Coil

PRICES

JACKSON SPECIAL COIL. Shown in cut, including all electrodes, cords, and tube stand, for alternating current $380.00
Code word, Kaiserhut.

JACKSON SPECIAL COIL. For 110 volts, direct current, as above, including rotary converter $450.00
Code word, Kaiserin.

JACKSON SPECIAL COIL. For 220 volts, direct current, as above, including rotary converter $470.00
Code word, Kaiserling.

LIST OF OUTFITS

In connection with any of the following outfits, a Milliamperemeter is recommended. This may be included at an additional cost of $30.00.

These outfits are given as samples only, and may be changed to suit the convenience of the purchaser.

OUTFIT NO. 60. For the alternating current.
Code word, Handlohn.

One Jackson Coil, complete, including set of metallic electrodes and tube stand	$350.00
One H. F. X-Ray Tube	14.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of Vacuum Electrodes with Handle	5.00
	$379.00

OUTFIT NO. 61. For the 110 volts direct current.
Code word, Handlubben.

Same as enumerated in Outfit No. 60	$379.00
Rotary Converter, complete, fitted in cabinet	70.00
	$449.00

For 220 volts, add to above $20.00.

OUTFIT NO. 64. For the alternating current.
Code word, Handmaiden.

One Jackson Coil, complete, including set of metallic electrodes and tube stand	$350.00
Two Type H. F. X-Ray Tubes	28.00
One 6 x 8 Platinum Barium Cyanide Fluoroscope	16.00
One set of Vacuum Electrodes with Handle	5.00
One set of six No. 17 and No. 18 Electrodes	10.00
One roll of Block Tin, 10 pounds	2.50
Two Mineral Tubes	6.00
One Willemite Tube	5.00
	$422.50

OUTFIT NO. 65. For the 110 volts direct current.
Code word, Handmandel.

Same as enumerated in Outfit No. 64	$422.50
Rotary Converter, complete and fitted in cabinet	70.00
	$492.50

For 220 volts, add to above, $20.00.

OUTFIT NO. 66. For the alternating current.
Code word, Handmesser.

One Jackson Coil, complete, including set of metallic electrodes and tube stand	$350.00
Two Type H. F. X-Ray Tubes	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of Vacuum Electrodes with Handle	5.00
One set of six No. 17 and No. 18 Electrodes	10.00
One roll of Block Tin, 10 pounds	2.50
Two Mineral Tubes	6.00
One Willemite Tube	6.00
Cautery Attachment	25.00
One Handle and Snare	6.00
Eight Cautery Knives	6.00
Ultra Violet Attachment	60.00
One Quartz Compressor	5.00
One pair Cautery Cords	1.50
	$521.00

OUTFIT NO. 67. For the direct current.
Code word, Handmolen.

Same as enumerated in Outfit No. 66	
Rotary Converter, complete, fitted in cabinet	

For 220 volts, add to above, $20.00.

OUTFIT NO. 68. For the alternating current.
Code word, Kalomel.

Jackson Special Coil, as shown in cut	
One Type H. F. X-Ray Tube	
One 5 x 7 Platinum Barium Cyanide Fluoroscope	
Four pounds Block Tin	

OUTFIT NO. 69. For the 110-volt direct current.
Code word, Kalong.

Same as in Outfit No. 68	
Rotary Converter, fitted in cabinet	

For the 220-volt direct current, add to the above $20.00.

The Cyclone Coil

The illustration shows a plain, compact, all-round coil, wh unexcelled for general work. This coil will give all the effects obta from the Jackson Coil, with the exception of the effleuve. In addit is a powerful X-ray generator. The cabinet is of handsome quartere When the coil is used on the alternating current, three drawers ar vided for storage purposes. When used on the direct current, the occupied by the lower drawer is taken up by a rotary converter. price includes a tube stand, connecting cord, X-ray cords, handle sponges for applying the thermo-faradic and D'Arsonval currents. T is put up in three different styles of cabinets, the working parts ar output being the same in each case, the only difference being i cabinet work.

The illustration on page 16 is really the top section of the cabinet, previously shown. The portable type (see cut on pag is an extremely serviceable and useful instrument. It can readi carried in a buggy or other conveyance, and can be attached alternating current lamp socket. All the parts shown in the upper tration may be packed in the base of the coil, making it entirely contained. The coil will run with perfect steadiness and success. spark-gap is very similar to that on the Jackson Coil, and wil indefinitely without attention.

LIST OF OUTFITS

n connection with any of the following outfits, a Milliamperemeter is recom-ed. This may be included at an additional cost of $30.00.

hese outfits are given as samples only, and may be changed to suit the nience of the purchaser.

FIT NO. 60. For the alternating current.
le word, Handlohn.

ackson Coil, complete, including set of metallic electrodes and tube tand	$350.00
I. F. X-Ray Tube	14.00
x 7 Platinum Barium Cyanide Fluoroscope	10.00
et of Vacuum Electrodes with Handle	5.00
	$379.00

FIT NO. 61. For the 110 volts direct current.
le word, Handlubben.

as enumerated in Outfit No. 60	$379.00
y Converter, complete, fitted in cabinet	70.00
	$449.00

220 volts, add to above $20.00.

FIT NO. 64. For the alternating current.
e word, Handmaiden.

ackson Coil, complete, including set of metallic electrodes and ube stand	$350.00
ype H. F. X-Ray Tubes	28.00
x 8 Platinum Barium Cyanide Fluoroscope	16.00
et of Vacuum Electrodes with Handle	5.00
et of six No. 17 and No. 18 Electrodes	10.00
oll of Block Tin, 10 pounds	2.50
lineral Tubes	6.00
illemite Tube	5.00
	$422.50

IT NO. 65. For the 110 volts direct current.
e word, Handmandel.

as enumerated in Outfit No. 64	$422.50
y Converter, complete and fitted in cabinet	70.00
	$492.50

220 volts, add to above, $20.00.

IT NO. 66. For the alternating current.
e word, Handmesser.

ackson Coil, complete, including set of metallic electrodes and tube and	$350.00
ype H. F. X-Ray Tubes	28.00
x 7 Platinum Barium Cyanide Fluoroscope	10.00
t of Vacuum Electrodes with Handle	5.00
t of six No. 17 and No. 18 Electrodes	10.00
ll of Block Tin, 10 pounds	2.50
ineral Tubes	6.00
illemite Tube	6.00
y Attachment	25.00
andle and Snare	6.00
Cautery Knives	6.00
Violet Attachment	60.00
uartz Compressor	5.00
ir Cautery Cords	1.50
	$521.00

OUTFIT NO. 67. For the direct current.
Code word, Handmolen.

Same as enumerated in Outfit No. 66	$521.00
Rotary Converter, complete, fitted in cabinet	70.00
	$591.00

For 220 volts, add to above, $20.00.

OUTFIT NO. 68. For the alternating current.
Code word, Kalomel.

Jackson Special Coil, as shown in cut	$380.00
One Type H. F. X-Ray Tube	14.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
Four pounds Block Tin	1.00
	$405.00

OUTFIT NO. 69. For the 110-volt direct current.
Code word, Kalong.

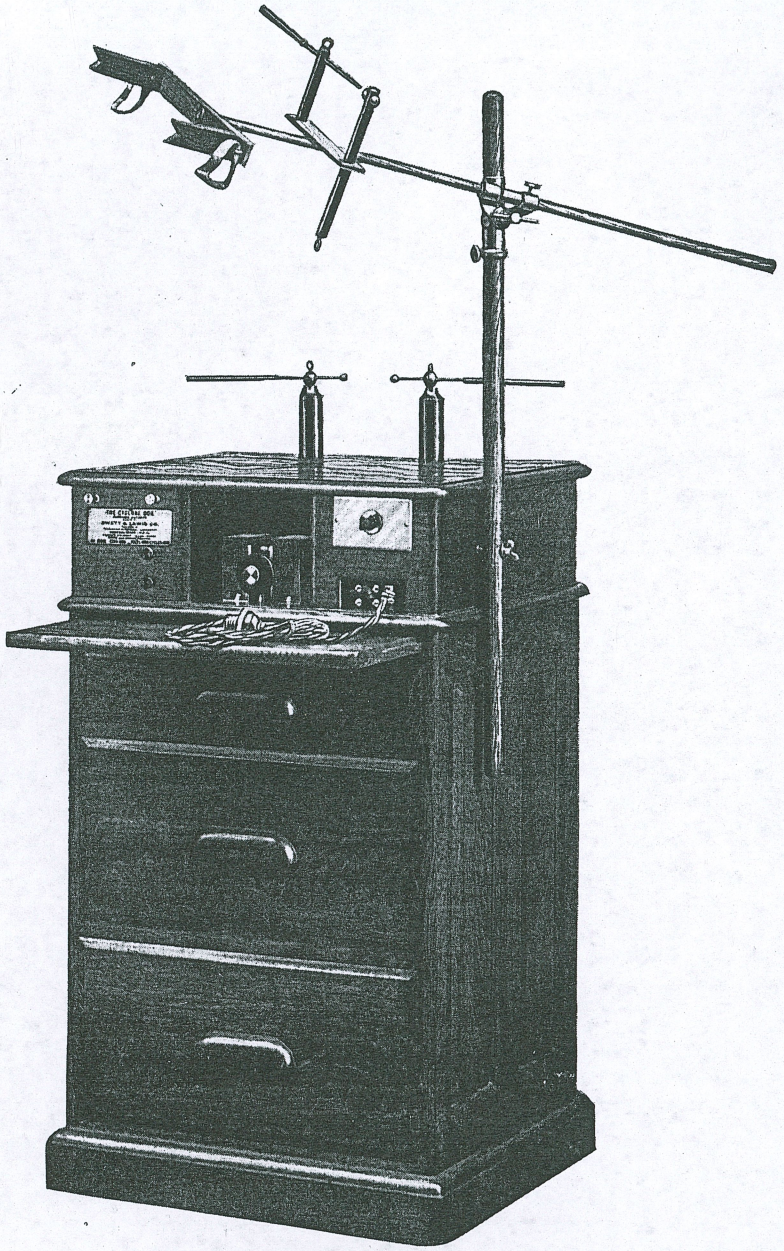
Same as in Outfit No. 68	$405.00
Rotary Converter, fitted in cabinet	70.00
	$475.00

For the 220-volt direct current, add to the above $20.00.

The Cyclone Coil

The illustration shows a plain, compact, all-round coil, which is unexcelled for general work. This coil will give all the effects obtainable from the Jackson Coil, with the exception of the effleuve. In addition, it is a powerful X-ray generator. The cabinet is of handsome quartered oak. When the coil is used on the alternating current, three drawers are provided for storage purposes. When used on the direct current, the space occupied by the lower drawer is taken up by a rotary converter. The price includes a tube stand, connecting cord, X-ray cords, handles and sponges for applying the thermo-faradic and D'Arsonval currents. The coil is put up in three different styles of cabinets, the working parts and the output being the same in each case, the only difference being in the cabinet work.

The illustration on page 16 is really the top section of the floor cabinet, previously shown. The portable type (see cut on page 17) is an extremely serviceable and useful instrument. It can readily be carried in a buggy or other conveyance, and can be attached to an alternating current lamp socket. All the parts shown in the upper illustration may be packed in the base of the coil, making it entirely self-contained. The coil will run with perfect steadiness and success. The spark-gap is very similar to that on the Jackson Coil, and will run indefinitely without attention.



The Cyclone Cabinet Coil

PRICES

THE CYCLONE COIL. Floor Type, including tube stand and connecting cords, fitted to run on any alternating current $210.00
Code word, Gloriation.

THE CYCLONE COIL. As above, for 110 volts, direct current, including rotary converter $280.00
Code word, Glorify.

LIST OF OUTFITS

OUTFIT NO. 70. For the alternating current.
Code word, Kaaskamer.
The Cyclone Coil, Floor Type, including tube stand ..... $
One Type H. F. X-Ray Tube.....
One 5 x 7 Platinum Barium Cyanide Fluoroscope.....
One set of Vacuum Electrodes.....
$

OUTFIT NO. 71. For 110 volts, direct current.
Code word, Kaaskoek.
Same as enumerated in Outfit No. 70 ..... $
Rotary Converter .....
$

For 220 volts, add $20.00 to above.

OUTFIT NO. 74. For the alternating current.
Code word, Kaasleb.
The Cyclone Coil, Floor Type, including tube stand ..... $
Two Type H. F. X-Ray Tubes .....
One 5 x 7 Platinum Barium Cyanide Fluoroscope.....
Four pounds X-Ray Foil .....
One set of six No. 17 and No. 18 Electrodes .....
One set of Vacuum Electrodes .....
Two Mineral Tubes .....
One High Frequency Milliampere[illegible]eter .....
Base and Standard of Floor Stand.....
$

OUTFIT NO. 75. For 110 volts, direct current.
Code word, Kaasmaden.
Same as enumerated in Outfit No. 74 ..... $
Rotary Converter .....
$

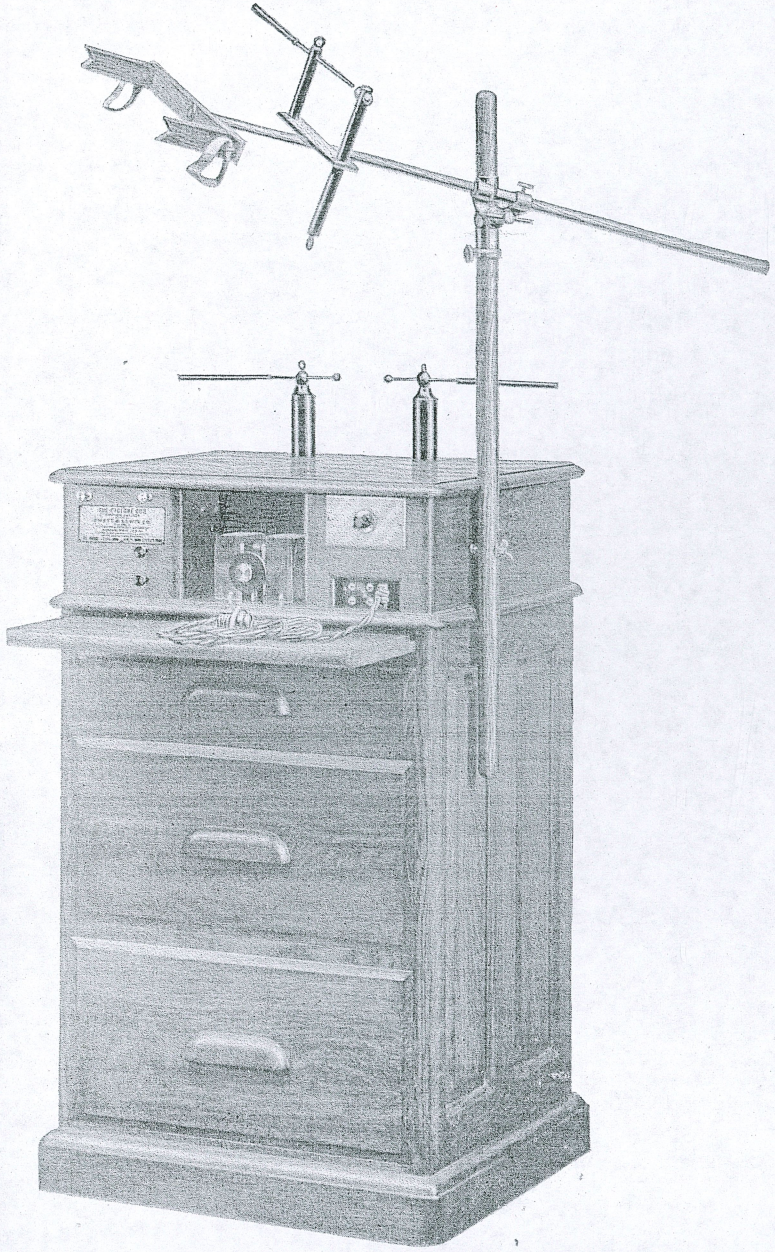
For 220 volts, add $20.00 to above.

OUTFIT NO. 76. For the alternating current.
Code word, Rhodanicum.
The Cyclone Coil, Desk Type, including tube stand ..... $
One Type H. F. X-Ray Tube .....
One 5 x 7 Platinum Barium Cyanide Fluoroscope .....
One set of Vacuum Electrodes .....
$

OUTFIT NO. 77. For 110 volts, direct current.
Code word, Rhodanthes.
Same as enumerated in Outfit No. 72 ..... $
Rotary Converter .....
$

For 220 volts, add $20.00 to above.

OUTFIT NO. 90. For the alternating current.
Code word, Krent.
The Cyclone Coil, Portable Type, including tube stand ..... $
One Type H. F. X-Ray Tube .....
One 5 x 7 Platinum Barium Cyanide Fluoroscope.....
One set of six Vacuum Electrodes .....
Four pounds X-Ray Foil .....
$



The Cyclone Cabinet Coil

PRICES

CYCLONE COIL. Floor Type, including tube stand and connecting cords, fitted to run on any alternating current $210.00
e word, Gloriation.

CYCLONE COIL. As above, for 110 volts, direct current, includ-

LIST OF OUTFITS

OUTFIT NO. 70. For the alternating current.
Code word, Kaaskamer.

The Cyclone Coil, Floor Type, including tube stand	$210.00
One Type H. F. X-Ray Tube	14.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of Vacuum Electrodes	5.00
	$239.00

OUTFIT NO. 71. For 110 volts, direct current.
Code word, Kaaskoek.

Same as enumerated in Outfit No. 70	$239.00
Rotary Converter	70.00
	$309.00

For 220 volts, add $20.00 to above.

OUTFIT NO. 74. For the alternating current.
Code word, Kaasleb.

The Cyclone Coil, Floor Type, including tube stand	$210.00
Two Type H. F. X-Ray Tubes	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
Four pounds X-Ray Foil	1.00
One set of six No. 17 and No. 18 Electrodes	10.00
One set of Vacuum Electrodes	5.00
Two Mineral Tubes	6.00
One High Frequency Milliampere[illegible]eter	30.00
Base and Standard of Floor Stand	5.00
	$305.00

OUTFIT NO. 75. For 110 volts, direct current.
Code word, Kaasmaden.

Same as enumerated in Outfit No. 74	$305.00
Rotary Converter	70.00
	$375.00

For 220 volts, add $20.00 to above.

OUTFIT NO. 76. For the alternating current.
Code word, Rhodanicum.

The Cyclone Coil, Desk Type, including tube stand	$185.00
One Type H. F. X-Ray Tube	14.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of Vacuum Electrodes	5.00
	$214.00

OUTFIT NO. 77. For 110 volts, direct current.
Code word, Rhodanthes.

Same as enumerated in Outfit No. 72	$214.00
Rotary Converter	70.00
	$284.00

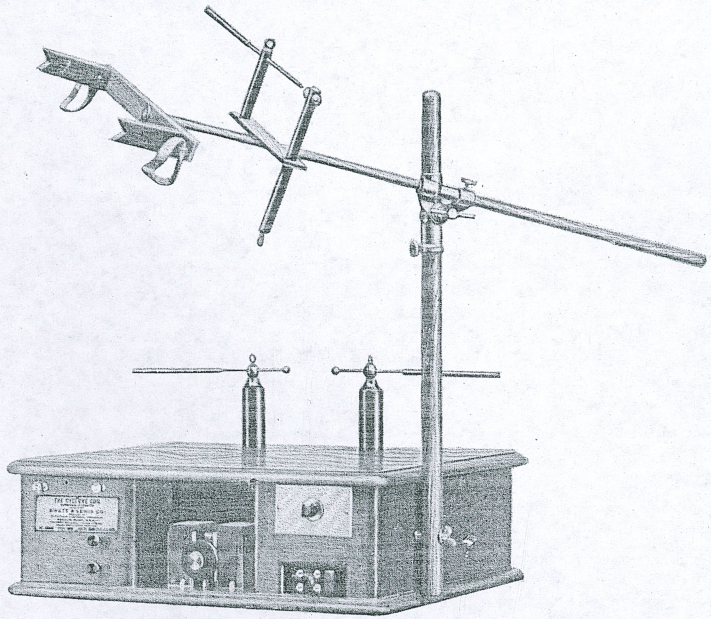
For 220 volts, add $20.00 to above.

OUTFIT NO. 90. For the alternating current.
Code word, Krent.

The Cyclone Coil, Portable Type, including tube stand	$185.00
One Type H. F. X-Ray Tube	14.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of six Vacuum Electrodes	5.00
Four pounds X-Ray Foil	1.00
	$215.00

OUTFIT NO. 91. For the alternating current.
Code word, Krepp.

The Cyclone Coil, Portable Type, including tube stand	$185.00
Two Type H. F. X-Ray Tubes	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One set of six Vacuum Electrodes	5.00
Eight pounds X-Ray Foil	2.00
One set of six Electrodes, No. 17 and No. 18	10.00
One Carrying Case for tubes and electrodes	10.00
	$250.00



The Cyclone Desk Coil

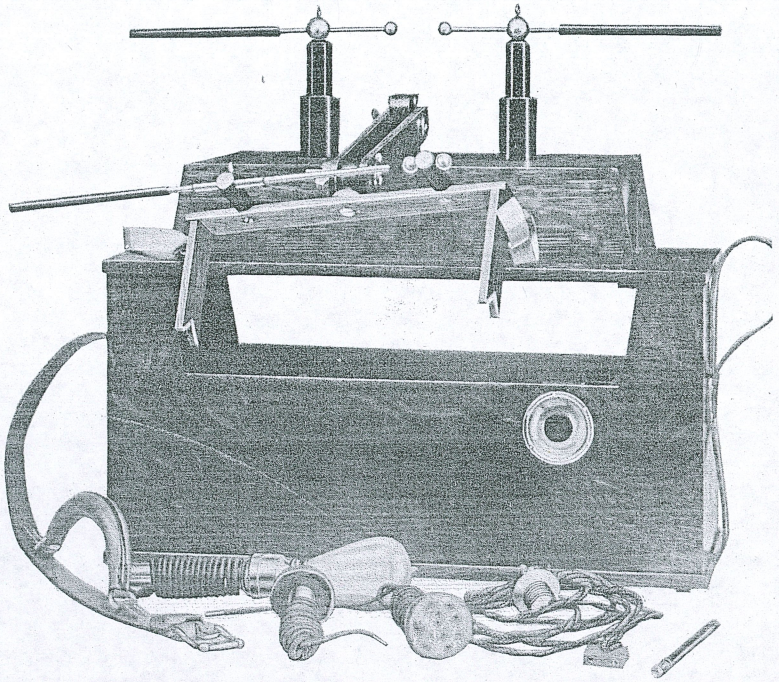
THE CYCLONE COIL. Desk Type, including tube stand and connecting cords, fitted to run on any alternating current $185.00
Code word, Gloriavamo.

The Cyclone Portable Coil

THE CYCLONE COIL. Portable Type, including tube stand and connecting cords, fitted to run on any alternating current $185.00
Code word, Glorificar.

ROTARY CONVERTER. For changing the 110-volt direct current to alternating $70.00
Code word, Hervatting.

ROTARY CONVERTER. For changing the 220-volt direct current to alternating $90.00
Code word, Hervimos.

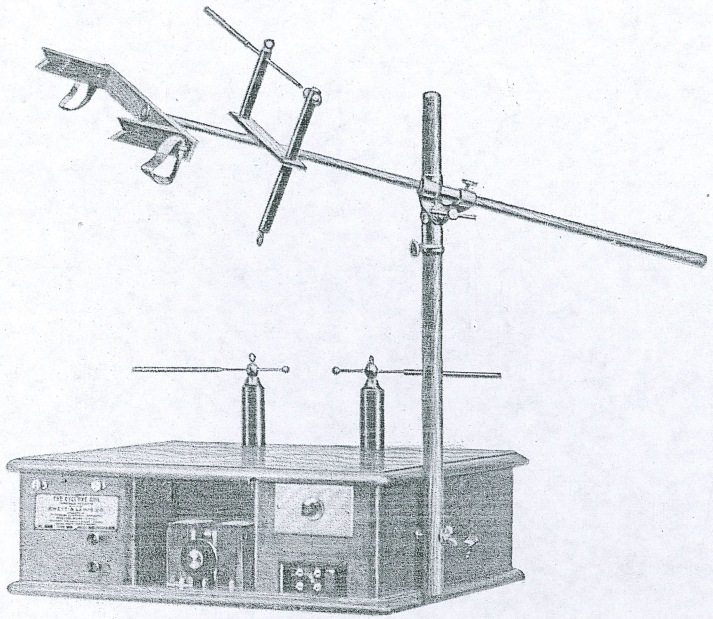


The Cyclone Portable Coil — Open

The Cyclone Portable Coil — Closed

FIT NO. 91. For the alternating current.
de word, Krepp.

Cyclone Coil, Portable Type, including tube stand	$185.00
Type H. F. X-Ray Tubes	28.00
5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
set of six Vacuum Electrodes	5.00
t pounds X-Ray Foil	2.00
set of six Electrodes, No. 17 and No. 18	10.00
Carrying Case for tubes and electrodes	10.00
	$250.00



The Cyclone Desk Coil

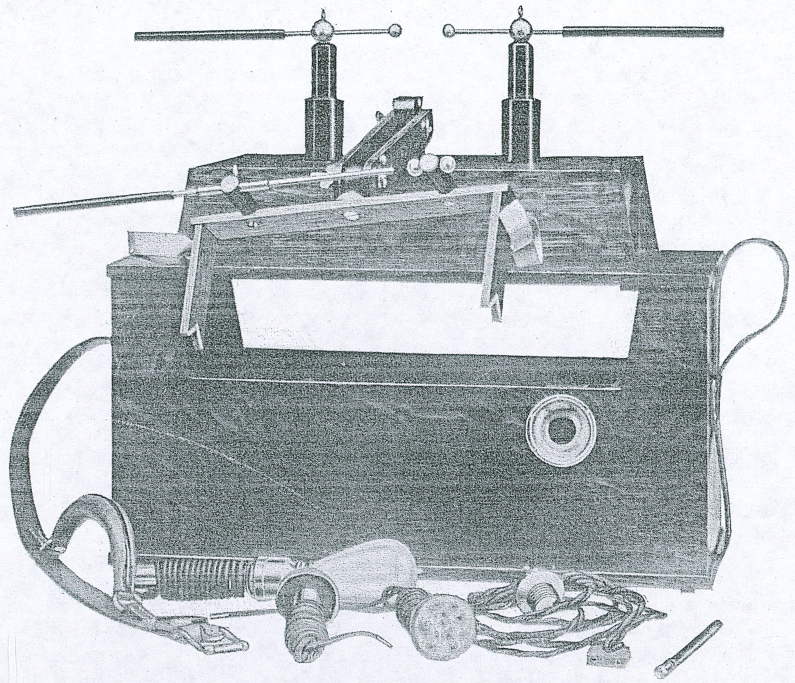
CYCLONE COIL. Desk Type, including tube stand and connecting cords, fitted to run on any alternating current $185.00
e word, Gloriavamo.

The Cyclone Portable Coil

CYCLONE COIL. Portable Type, including tube stand and connecting cords, fitted to run on any alternating current $185.00
e word, Glorificar.

RY CONVERTER. For changing the 110-volt direct current to ternating $70.00
e word, Hervatting.

RY CONVERTER. For changing the 220-volt direct current to ternating $90.00
e word, Hervimos.

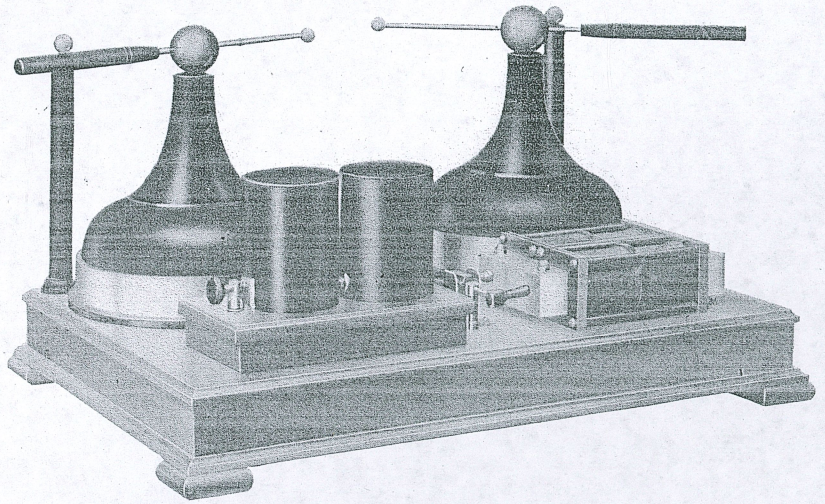


The Cyclone Portable Coil — Open

The Cyclone Portable Coil — Closed

The Kinraide Coil

This coil is very satisfactory for all ordinary X-ray work, and may also be used in connection with vacuum electrodes. There has recently been added to the coil a new interrupter, which works with perfect steadiness. This is shown in the left foreground of the illustration. Owing to its peculiar construction, the coil will not burn out or break down. It can be furnished for either the direct or the alternating current. A very powerful ultra-violet equipment may be added, if desired.



The Kinraide Coil

PRICES

Price of the interrupter only	$25.00
Full directions for attaching and operating accompany same. Code word, Ignore.	

LIST OF OUTFITS

OUTFIT NO. 33. For direct current.
Code word, Unpublic.

One Direct Current Kinraide Coil with new interrupter	$150.00
Two Tubes, Type K	24.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One Floor Tube Stand	10.00
One Rheostat	8.00
	$202.00

OUTFIT NO. 34. For alternating current.
Code word, Vestifluam.

One Alternating Current Kinraide Coil with new interrupter	$150.00
Two Tubes, Type H. F.	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One Floor Tube Stand	10.00
One Rheostat	8.00
	$206.00

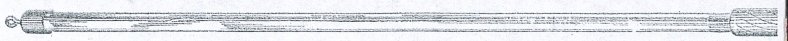
OUTFIT NO. 37. For alternating current.
Code word, Timindos.

One Alternating Current Kinraide Coil and Ultra Violet Apparatus combined, also new interrupter	$
Two Tubes, Type H. F.	
One 5 x 7 Platinum Barium Cyanide Fluoroscope	
One Floor Tube Stand	
One Rheostat	
	$

We recommend the purchase of a set of Vacuum Electrodes, price $5.00 each of the above outfits, also four pounds of X-Ray Foil, price, $1.00.

Nealey Electrodes

It is well known that one of the most useful methods of tre with either Static or High Frequency currents is by means of the discharge or effleuve. Some reliable means of regulating this efl has long been needed. Wooden electrodes have been used by and while they were green and full of moisture, have worked nicely. The moisture soon dries out. Especially during the w when the air is heated from some artificial source, it is almost impo to keep the wood properly filled with water. This takes a great d time and considerable patience. After wooden electrodes have used for some time the tip carbonizes and becomes so dry and of high resistance that sharp sparks may pass, to the annoyance o patients and the operator. With the Nealey Fluid Electrodes

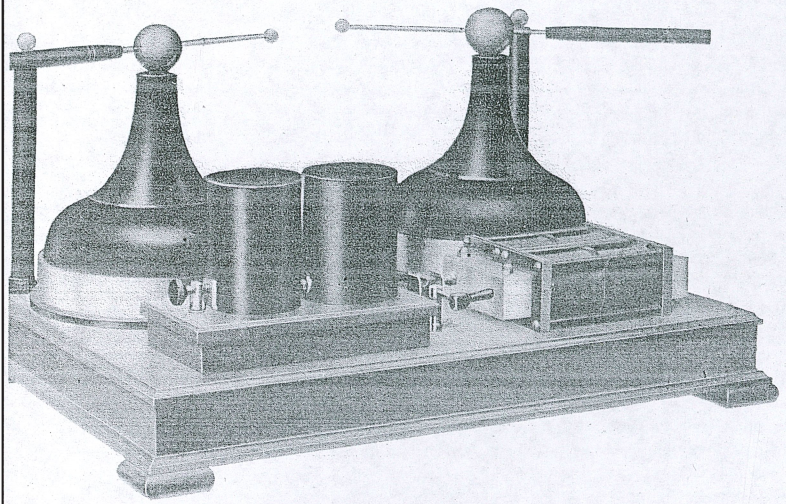


discharge is mild and perfectly regular. They are always ready to and give a beautiful brush discharge that can be used around the or face of even the most timid person, without the possibili accidental sparking. It is perfectly possible to increase the streng the discharge to a long, coarse brush such as would be adapte spinal, rheumatic or paralytic cases.

In a dry atmosphere, with a sixteen, revolving plate Static mac a voluminous blue brush, more than twenty inches in length, can be obtained. The electrodes are made of heavy, tough glass tubing wooden tips of three different shapes. The entire set is needed in

The Kinraide Coil

This coil is very satisfactory for all ordinary X-ray work, and may be used in connection with vacuum electrodes. There has recently added to the coil a new interrupter, which works with perfect iness. This is shown in the left foreground of the illustration. g to its peculiar construction, the coil will not burn out or break .. It can be furnished for either the direct or the alternating cur- A very powerful ultra-violet equipment may be added, if desired.



The Kinraide Coil

PRICES

of the interrupter only	$25.00

directions for attaching and operating accompany same.
e word, Ignore.

LIST OF OUTFITS

IT NO. 33. For direct current.
e word, Unpublic.

rect Current Kinraide Coil with new interrupter	$150.00
ubes, Type K	24.00
x 7 Platinum Barium Cyanide Fluoroscope	10.00
oor Tube Stand	10.00
heostat	8.00
	$202.00

IT NO. 34. For alternating current.
e word, Vestifluam.

ternating Current Kinraide Coil with new interrupter	$150.00
ubes, Type H. F.	28.00
x 7 Platinum Barium Cyanide Fluoroscope	10.00
oor Tube Stand	10.00
heostat	8.00
	$206.00

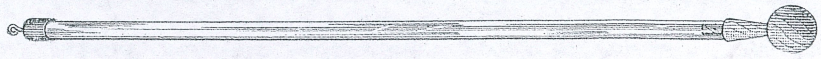
OUTFIT NO. 37. For alternating current.
Code word, Timindos.

One Alternating Current Kinraide Coil and Ultra Violet Apparatus combined, also new interrupter	$195.00
Two Tubes, Type H. F.	28.00
One 5 x 7 Platinum Barium Cyanide Fluoroscope	10.00
One Floor Tube Stand	10.00
One Rheostat	8.00
	$251.00

We recommend the purchase of a set of Vacuum Electrodes, price $5.00, with each of the above outfits, also four pounds of X-Ray Foil, price, $1.00.

Nealey Electrodes

It is well known that one of the most useful methods of treating with either Static or High Frequency currents is by means of the brush discharge or effleuve. Some reliable means of regulating this effleuve has long been needed. Wooden electrodes have been used by some, and while they were green and full of moisture, have worked very nicely. The moisture soon dries out. Especially during the winter, when the air is heated from some artificial source, it is almost impossible to keep the wood properly filled with water. This takes a great deal of time and considerable patience. After wooden electrodes have been used for some time the tip carbonizes and becomes so dry and of such high resistance that sharp sparks may pass, to the annoyance of the patients and the operator. With the Nealey Fluid Electrodes, the



discharge is mild and perfectly regular. They are always ready to work and give a beautiful brush discharge that can be used around the head or face of even the most timid person, without the possibility of accidental sparking. It is perfectly possible to increase the strength of the discharge to a long, coarse brush such as would be adapted for spinal, rheumatic or paralytic cases.

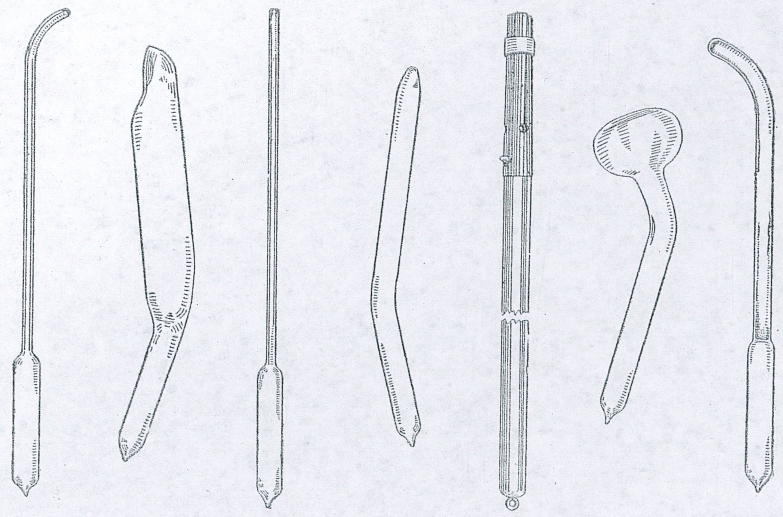
In a dry atmosphere, with a sixteen, revolving plate Static machine, a voluminous blue brush, more than twenty inches in length, can easily be obtained. The electrodes are made of heavy, tough glass tubing with wooden tips of three different shapes. The entire set is needed in order

to get the most complete graduation of discharge. The tubes are filled with a special resistance liquid designed to allow the passage of just the right amount of current to produce the best brush without sparking. This is a very important feature. When ordering, be sure to give make of your Static machine, and the number and size of revolving plates, so that proper resistance liquid may be sent you. The wooden tips are porous enough to absorb the proper amount of fluid from the tube for best results. This set of electrodes is by far the most economical for the busy physician. Except for possible breakage of the glass tube, the electrodes will last indefinitely, as the tips do not carbonize or deteriorate

Price per set of three electrodes, with a supply of liquid $10.00
Single electrode, with a supply of liquid 4.00
Code word for Set, Galgulus.
Code word for Ball, Galhardo.
Code word for Point, Galhofa.
Code word for Cylinder, Galianos.

Fluid, per pint $1.00
Code word, Galiarius.

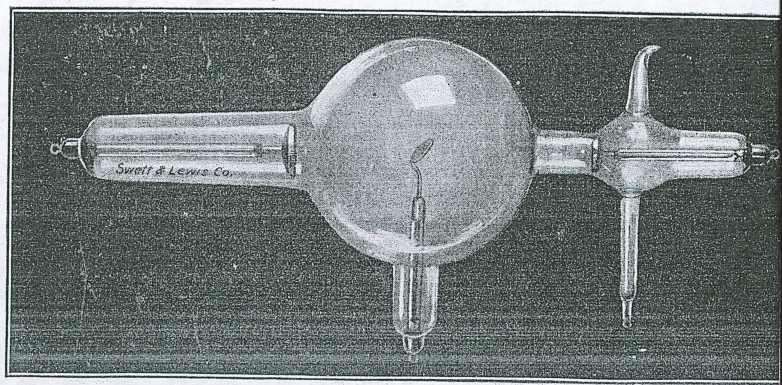
Vacuum Electrodes



For a cheap but substantial set for all-round use containing all of the most used Electrodes, the one shown in the above cut is recommended.

	Handle	$0.75.	Code word, Koulbac
No. 3A	Rectal (without bulb)	.75.	Code word, Kouler
No. 5	Urethral, curved	.75.	Code word, Koulougli
No. 7A	Urethral, straight	.75.	Code word, Koumiss
No. 11A	Vaginal, with cupped end	.75.	Code word, Koupara
No. 14A	General external work	.75.	Code word, Koupholite
No. 20A	Eustachian	.75.	Code word, Kourakin
Price for Set and Handle		5.00.	Code word, Koukarien

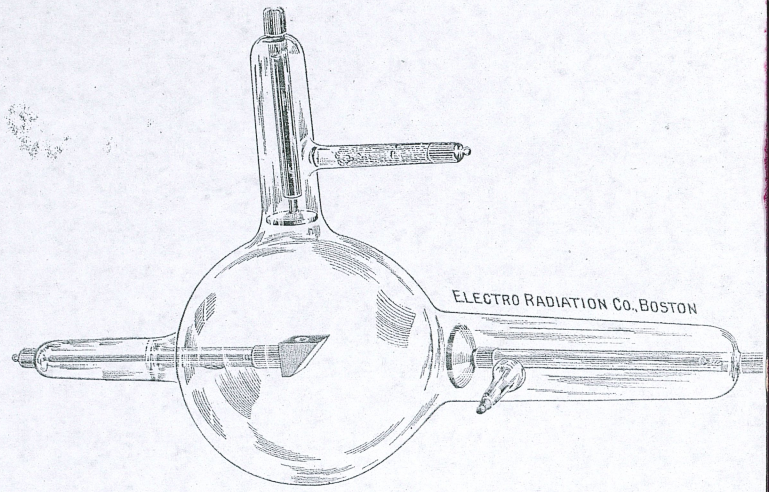
Tubes



H. F. Type X-Ray Tube

This tube is especially designed for use with high frequency It is the result of many years' experimentation, and will run with satisfaction. Owing to the position of the terminals the reverse are choked back so that the hemispherical effect is obtainable.

Code word, Dejor ..... Price,



X. Type X-Ray Tube

This tube is a modification of the type H. F., and has an extre heavy and re-inforced anode so that a large quantity of current be used without overheating. It is especially recommended for h work.

Code word, Derivant ..... Price, $

t the most complete graduation of discharge. The tubes are filled a special resistance liquid designed to allow the passage of just the amount of current to produce the best brush without sparking. s a very important feature. When ordering, be sure to give make ır Static machine, and the number and size of revolving plates, so proper resistance liquid may be sent you. The wooden tips are s enough to absorb the proper amount of fluid from the tube for esults. This set of electrodes is by far the most economical for usy physician. Except for possible breakage of the glass tube, lectrodes will last indefinitely, as the tips do not carbonize or orate

per set of three electrodes, with a supply of liquid $10.00
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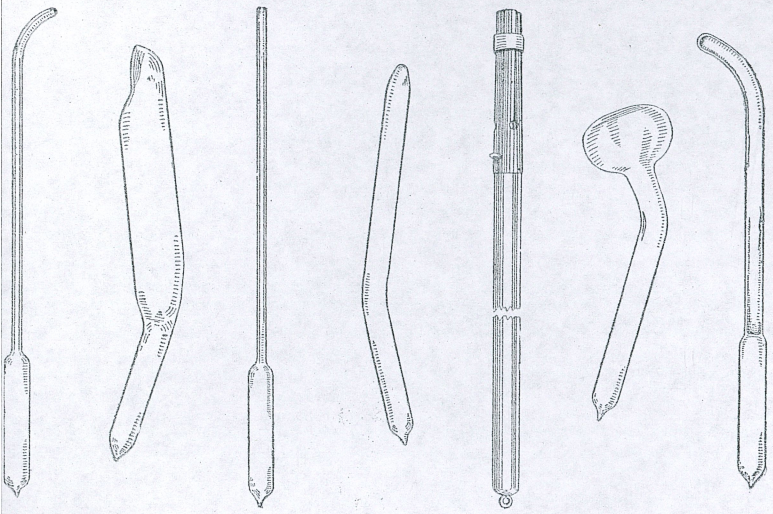
e word for Point, Galhofa.
e word for Cylinder, Galianos.

per pint $1.00
e word, Galiarius.

Vacuum Electrodes



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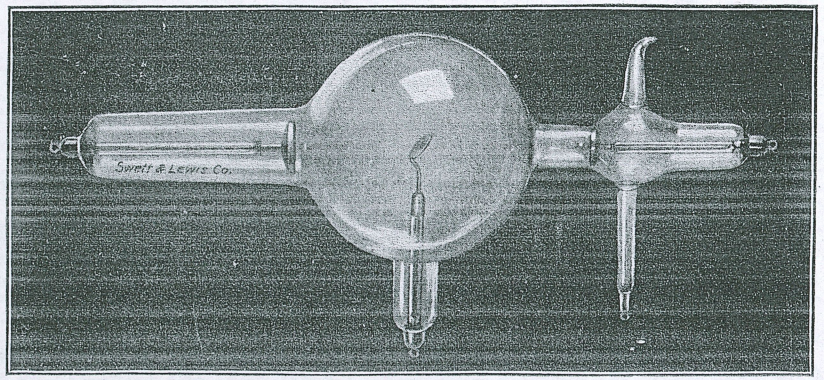
A	Urethral, straight	.75.	Code word, Koumiss
A	Vaginal, with cupped end	.75.	Code word, Koupara
A	General external work	.75.	Code word, Koupholite
A	Eustachian	.75.	Code word, Kourakin
or	Set and Handle	5.00.	Code word, Koukarien

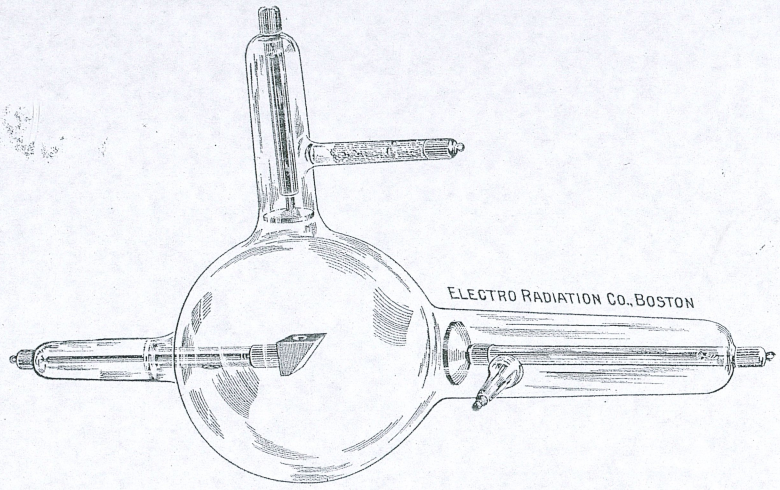
Tubes



H. F. Type X-Ray Tube

This tube is especially designed for use with high frequency coils. It is the result of many years' experimentation, and will run with good satisfaction. Owing to the position of the terminals the reverse waves are choked back so that the hemispherical effect is obtainable.

Code word, Dejor ..... Price, $14.00

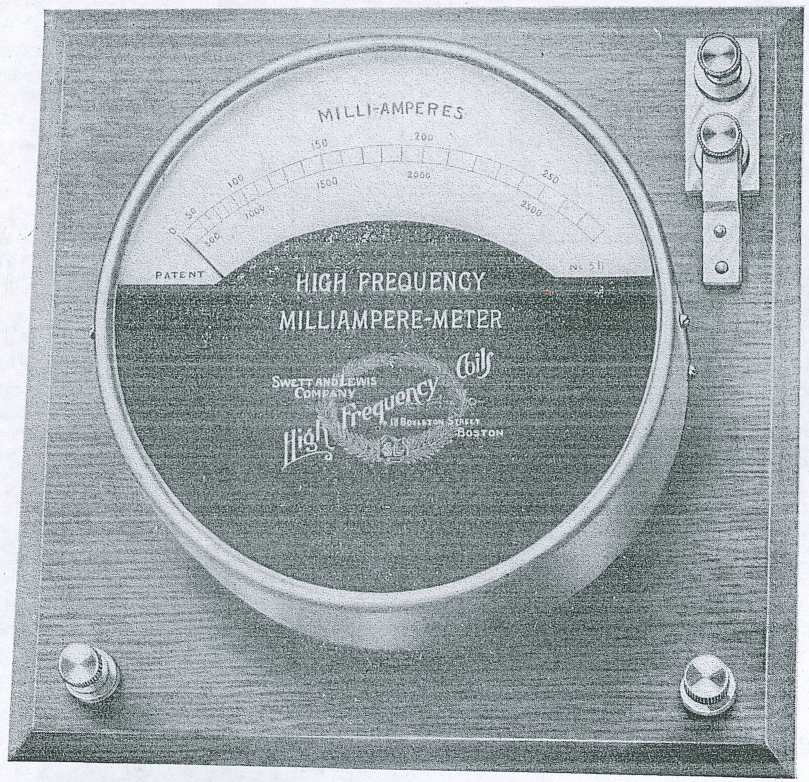


X. Type X-Ray Tube

This tube is a modification of the type H. F., and has an extremely heavy and re-inforced anode so that a large quantity of current may be used without overheating. It is especially recommended for heavy work.

Code word, Derivant ..... Price, $17.00

Milliamperemeter



It has but recently been possible to secure a reliable meter to measure currents of high and other frequencies. The value of an instrument of this sort must be conceded by all. For all-round work, the one illustrated is without a peer. It will record accurately the dosage on any current which a physician may wish to administer, galvanic, faradic, static, high frequency and X-ray.

The meter has a high and a low scale, the former reading to 2500 milliamperes, and the latter to 250. The case is of beautifully finished brass, and is mounted on an oak base.

Full directions for connecting and operating accompany each instrument.

Code word, Sostegno ..... Price, $30.00

Fluoroscopes

Platinum Barium Cyanide Fluoroscope

The very best platinum barium cyanide screens are used i fluoroscopes.

PRICES

Platinum Barium Cyanide Fluoroscope, 5 x 7 (code word, Earshrift) . .
Platinum Barium Cyanide Fluoroscope, 6 x 8 (code word, Earthling) .
Platinum Barium Cyanide Fluoroscope, 8 x 10 (code word, Earthly) . . .
Screens only, price per square inch .....

Silicate Fluoroscopes

The screens used in these fluoroscopes are coated with a new ma whose fluorescent properties have just been discovered. It well-known fact that platinum barium cyanide screens deteriorate a time, but are the most brilliant known when new. The silicate has the disadvantage that it is not quite as brilliant as a new pla barium cyanide, but the great point in its favor is its absolutely l qualities. It is fully as brilliant as a two or three-months-old pla screen and never changes. The silicate screen is as durable as a of sandpaper. It may be washed or handled without detriment. or moisture have no effect on it.

PRICES

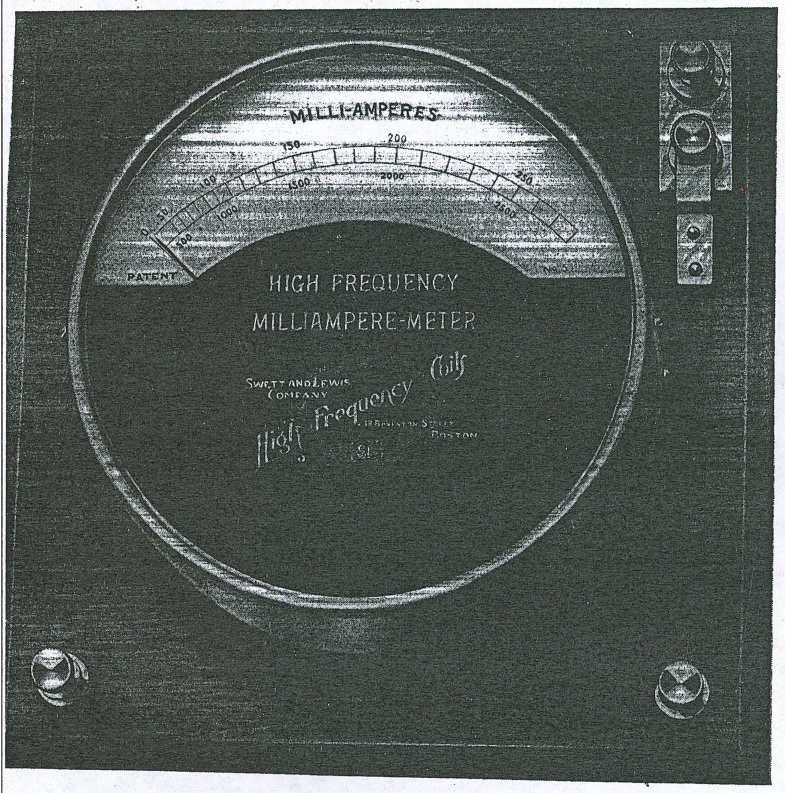
Silicate Fluoroscope, 5 x 7 (code word, Engalgaban) .....
Silicate Fluoroscope, 6 x 8 (code word, Engalgada) .....
Silicate Fluoroscope, 8 x 10 (code word, Engalgados) .....
Silicate Fluoroscope, 10 x 12 (code word, Engalla) .....
Screens only, price per square inch .....

Code Words

Describing Electric Light Circuits

104 volts, 60 cycles ..... Kope
110 volts, 60 cycles ..... Ko
110 volts, 133 cycles ..... Kope
110 volts, 125 cycles ..... Kope
110 volts, 25 cycles I
250 volts, 25 cycles ..... Ke
250 volts, 60 cycles ..... Keepr
110 volts, Direct Current ..... Intar
220 volts, Direct Current ..... Inta
235 volts, Direct Current ..... Inta
250 volts, Direct Current ..... Int
500 volts, Direct Current ..... Int

Milliamperemeter



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Fluoroscopes

Platinum Barium Cyanide Fluoroscope

The very best platinum barium cyanide screens are used in our fluoroscopes.

PRICES

Platinum Barium Cyanide Fluoroscope, 5 x 7 (code word, Earshrift) ..	$10.00
Platinum Barium Cyanide Fluoroscope, 6 x 8 (code word, Earthling) .	16.00
Platinum Barium Cyanide Fluoroscope, 8 x 10 (code word, Earthly) ...	24.00
Screens only, price per square inch	.25

Silicate Fluoroscopes

The screens used in these fluoroscopes are coated with a new material, whose fluorescent properties have just been discovered. It is a well-known fact that platinum barium cyanide screens deteriorate after a time, but are the most brilliant known when new. The silicate screen has the disadvantage that it is not quite as brilliant as a new platinum barium cyanide, but the great point in its favor is its absolutely lasting qualities. It is fully as brilliant as a two or three-months-old platinum screen and never changes. The silicate screen is as durable as a piece of sandpaper. It may be washed or handled without detriment. Heat or moisture have no effect on it.

PRICES

Silicate Fluoroscope, 5 x 7 (code word, Engalgaban)	$7.00
Silicate Fluoroscope, 6 x 8 (code word, Engalgada).....	9.00
Silicate Fluoroscope, 8 x 10 (code word, Engalgados)	14.00
Silicate Fluoroscope, 10 x 12 (code word, Engalla)	20.00
Screens only, price per square inch	.15

Code Words

Describing Electric Light Circuits

104 volts, 60 cycles.....	Kopernikus
110 volts, 60 cycles	Koperkies
110 volts, 133 cycles.....	Kopermolen
110 volts, 125 cycles.....	Kopermunt
110 volts, 25 cycles	Keepje
250 volts, 25 cycles	Keepmes
250 volts, 60 cycles	Keepmessen
110 volts, Direct Current	Intardatum
220 volts, Direct Current	Intardetis
235 volts, Direct Current	Intarlando
250 volts, Direct Current	Intarlare
500 volts, Direct Current	Intarlato

Terms

Prices in this bulletin are net, and supersede all others, except where cash accompanies order, in which case a discount of five per cent will be allowed.

In case of C. O. D. shipments, where a draft of twenty-five per cent of bill accompanies order, the same discount may be taken.

Remit by express or post-office money order or by New York draft. Add twenty-five cents to face of all checks, except on New York or Boston, to cover collection charges.

References

Customers unknown to us must give satisfactory references, send draft with order, or we will ship C. O. D., charges for return of money to be borne by purchaser.

Goods will be delivered f. o. b. freight or express, Boston, Mass. No charge for packing. Each piece of apparatus is carefully packed and no allowance will be made for loss or breakage in transit.

Western Union Telegraph code used. Telegraph and cable address, Swettxray.

When in Boston, we will be glad to have you make your headquarters at our office.

Murray and Emery Company, Printers, Boston

ELECTRO-
RADIATION
COMPANY.

Manufacturers of
HIGH FREQUENCY AND
X-RAY APPARATUS.

532 COLUMBUS AVENUE, BOSTON, MASS.

b.830

RECENT DEVELOPMENTS IN AMERICAN HIGH-FREQUENCY THERAPEUTICS.

T the present time there are two recognized schools of High Frequency Therapeutics.

The European System employs low voltage currents of great quantity derived from Solenoids or induced directly in the body of the patient, ("Auto-Conduction" and "Auto-Condensation"); local effects being obtained by the use of a mono-polar high voltage discharge from a Resonator. The invention of the latter instrument is due to Dr. Oudin, the original investigations in the use of the Solenoid currents having been conducted by Dr. d'Arsonval of Paris and reported by him to the French Academy upwards of a decade ago. About a year later an independent study of High-Frequency Therapeutics from an entirely different standpoint was begun in this country by Dr. Frederick F. Strong of Boston. His investigations in this field have continued uninterruptedly up to the present time and have resulted in the development of a system of treatment which is generally known as the "American High-Frequency Technique." Bi-polar currents are used, generated from apparatus of the Tesla-Thompson type, and combining enormous potential and frequency with relatively large quantity.

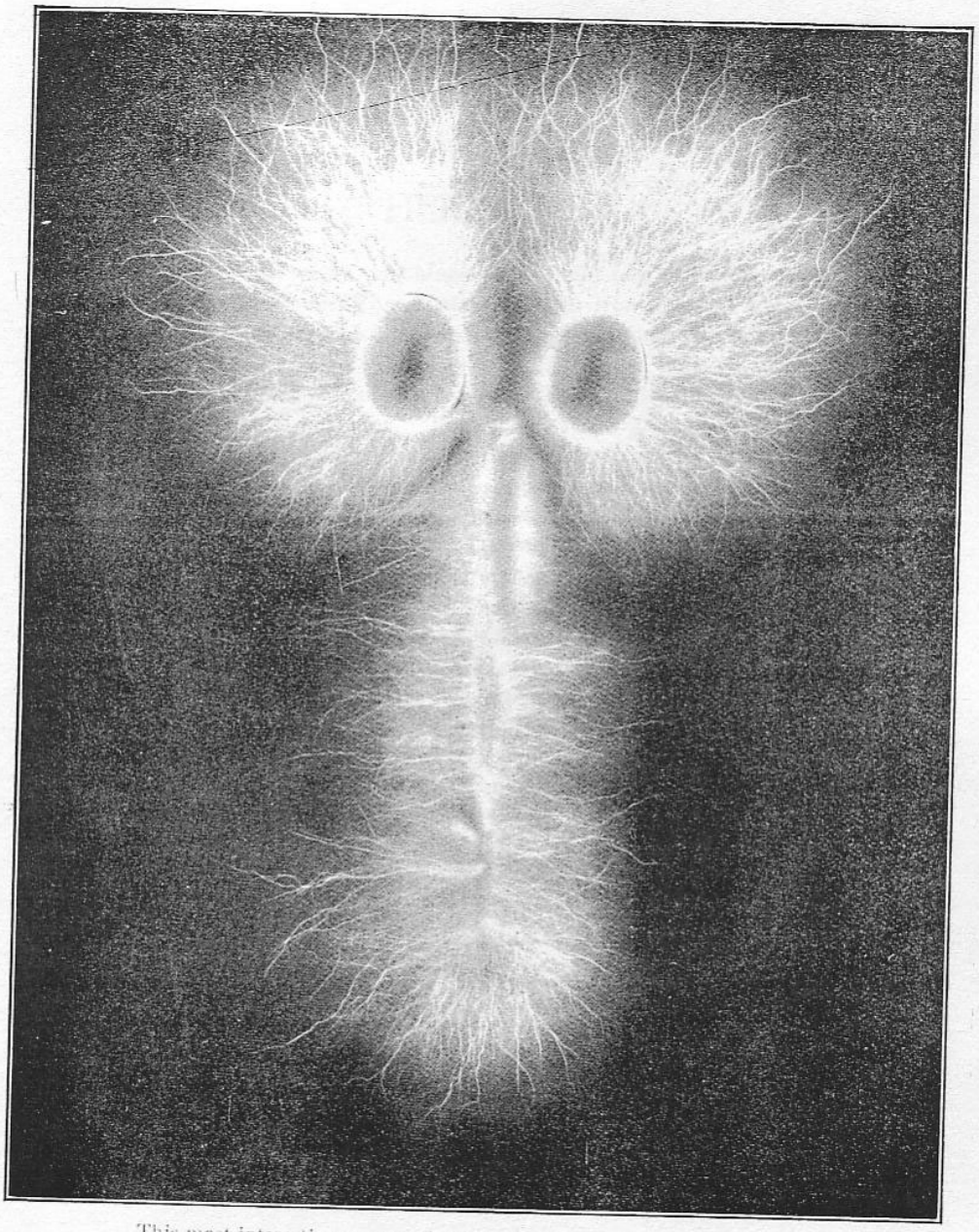
Dr. Strong developed his system of treatment in connection with a High-Frequency Apparatus of his own construction, which he employed in his practice for several years before the importance of the results led other members of the profession into the same field. At their request he placed his designs in the hands of manufacturers and in a short time the "Strong-Ovington Static Induction and High-Frequency Apparatus" was put upon the market. In evidence of the immediate popularity of this system of treatment it may be stated that whereas the above instrument was the only one of its type when

it was introduced to the profession in 1903, there are at present approximately a dozen different makes of machines of the same general character designed for the therapeutic use of High-Frequency currents in accordance with the technique developed by Dr. Strong. While European High-Frequency currents have a limited application, with the American Tesla apparatus we may cover almost the entire field of electro-therapeutics. This is accomplished through the application of a new principle, as follows: By the interposition of stationary or mechanically operated spark-gaps in series with a patient in a Tesla High-Frequency circuit there are superimposed upon the more rapid oscillations, wave currents of a low-frequency, which can be varied in voltage, wave form and quantity by changing the nature, size and position of the opposed surfaces of the spark-gap and by the interposition of various dialectrics such as glass, mica, vacuum tubes, etc.

This is a basis of the new technique for the therapeutic application of the Tesla currents, which will be fully explained in Dr. Strong's forthcoming work on High-frequency currents. The latest development of this principle is an attachment for the production of pure superimposed wave-currents of any desired frequency and of absolute smoothness and regularity. This device is about to be placed upon the market by the ELECTRO-RADIATION COMPANY of Boston, who are the authorized manufacturers of Dr. Strong's High-Frequency Apparatus, and who have just introduced a new series of machines from his latest designs, which cover the entire range of High Potential therapeutics.

The most important member of this group is known as the "HERCULES" apparatus and is regarded by the manufacturers as the crowning achievement of its inventor. Its manifold advantages can be fully appreciated only by those who have it in daily use, but the principal points of excellence may be briefly stated under the following headings. (See page 7.)

This most in
connecting a pair
atus, placing the
for a fraction of
this is a reproduc



This most interesting autograph of electro-radiant energy was obtained by connecting a pair of artery forceps to one pole of the Standard Portable Apparatus, placing the forceps upon the film of a sensitive plate and closing the switch for a fraction of a second. On development the picture was obtained of which this is a reproduction. It was taken by Dr. Strong in his laboratory.

[Facsimile.] (Form 2-A. 1-1-04-5000.)

BOSTON BOARD OF FIRE UNDERWRITERS,
NO. 55 KILBY STREET.
ROOM 61.

BOSTON, March 7, 1905.

Electro-Radiation Company,
Columbus Avenue,
Boston, Mass.

Gentlemen:—

In reply to your inquiry as to whether or not the High Frequency and X-Ray Apparatus manufactured by you meets with the approval of this Board, will say that the undersigned, early last week, made an inspection of one of your machines, wired by Mr. L. G. Henry, and would say that there will be no objection by this Board to the use of machines similarly wired.

Yours very truly,

Geo. H. Wilson

Chief Electrical Inspector.

4

The cabinets
panelled on all sid
the various workin
velvet-lined compa
are placed one on
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curtain if desired.
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rubber; above this
of plate glass, whic
terminals, which a
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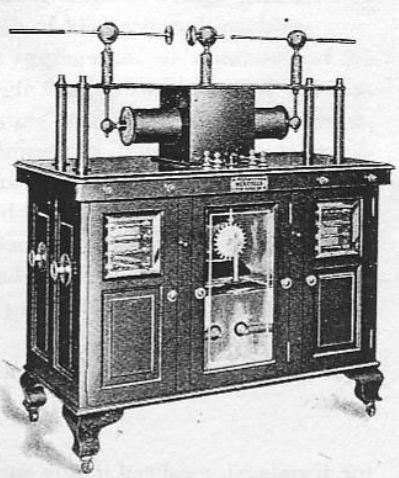
is conveniently loca
the cabinet. Conn
coil can be throw
then be used, if des
apparatus, such as
etc.

Each machine
obviates the neces
The apparatus is t
the case. Comple

THE "HERCULES."

The cabinets of these machines are of old oak or mahogany, panelled on all sides, with French plate doors in front, behind which the various working parts of the apparatus are mounted in separate velvet-lined compartments. Two banks of fluorescent Geissler tubes are placed one on each side of the central glass panel, for demonstration and experimental purposes. The Rotary spark-gap occupies the central compartment behind the glass; this can be shut off by a velvet curtain if desired. The high-tension coil, or Oscillator, is mounted on the top of the cabinet, and is entirely enclosed in massive hard rubber; above this, supported by four heavy rubber pillars, is a table of plate glass, which in turn supports the three massive, heavily plated terminals, which are mounted upon pedestals of selected Mexican onyx. The hard rubber knob by which the Spark-gap is regulated, is conveniently located in the centre and near the front of the top of the cabinet. Connecting posts are provided by which the high-tension coil can be thrown entirely out of the circuit, and the machine can then be used, if desired, to operate any of the European high-frequency apparatus, such as large Solenoids, condenser couches, Resonators, etc.

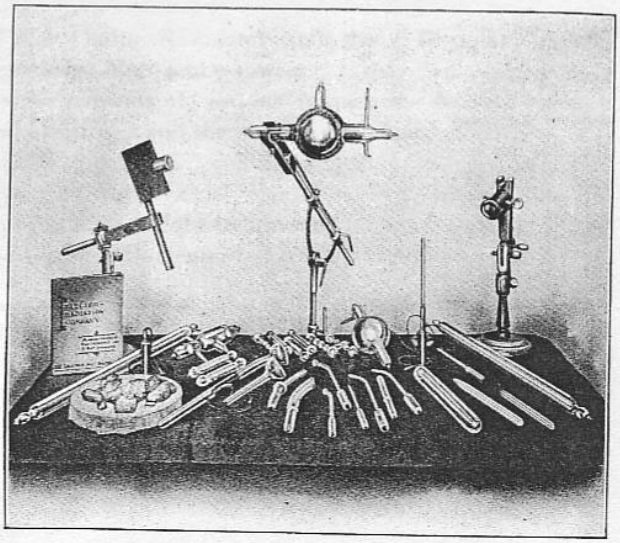
Each machine is sent out in a specially made packing case, which obviates the necessity of assembling the machines after shipment. The apparatus is therefore ready for use as soon as it is taken from the case. Complete directions are sent with each machine.



Price of "HERCULES"

For 104 volt alternating current, without accessories .	$450.00
For 110 volt direct current	500.00
Electrodes, X-Ray outfit and Ultra-violet Lamp (when purchased with the machine) . .	50.00

DIMENSIONS. — Length, 4 ft.; width, 25 in.; height to top of terminals, 52 in.



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ccessories . $450.00
. . . 500.00
Lamp
ine) . . 50.00
in.; height to top of

PRINCIPAL POINTS OF SUPERIORITY

IN

DR. STRONG'S "HERCULES" HIGH-FREQUENCY APPARATUS.

1.—BEAUTY OF DESIGN.

IN appearance this instrument stands in a class by itself, having been designed with an especial view to artistic elegance and symmetry. It is sufficient to state that even the manufacturers of rival apparatus have voluntarily described it as the most beautiful and impressive office instrument on the market.

This effect is mainly due to the richness of its materials and the æsthetic beauty of its design, there being no cheap ornamentation to detract from the harmonious effect of the instrument as a unit. It is the "Edition de Luxe" of Electro-medical Apparatus.

2.—SIMPLICITY.

A multiplicity of switches with complicated connections and adjustments is fatal to the success of a machine designed for general professional use. The busy practitioner has little time to devote to the study of electrical technology; for his uses the simplest apparatus is the best, provided it will produce the required results.

In this machine simplicity of operation has been carried almost to the limits of possibility, the entire apparatus being controlled literally by a "twist of the wrist;" a single switch starts, stops, increases or diminishes the current, and is so situated as to be always within the reach of the operator's hand.

It is to be remembered that this apparatus has been evolved during ten years of constant clinical test and laboratory experiment on the part of its inventor, whose medical education was supplemented

by a thorough scientific and technical training, enabling him to design and construct his own instruments, each idea worked out in the laboratory having been tested clinically before being permanently adopted as a factor in the construction of his perfected machine.

This apparatus is a unit, not an aggregation of a number of instruments packed together into a single case as are some of the machines now on the market. The simple current which it produces is, however, susceptible of many modifications which render it practically equal to a number of distinct forms of therapeutic electricity.

These modifications are obtained by varying the positions of the peculiar terminals with which the machine is provided, by the use of different forms of electrodes, by the adjustment of the perfected Spark-Gap, and by the attachment for the production of Dr. Strong's new Multi-frequency wave currents.

3.—VERSATILITY.

The thorough system of technique which has been developed for the clinical application of this apparatus enables the operator to produce practically all of the important physiological and therapeutic effects resulting from the medical application of other forms of electrical energy, viz: —

a Coarse and fine faradic and cautery currents.
b. Static spray and apark.
c. Morton wave current.
d. Sinusoidal current.
e. d'Arsonval "Auto-conduction" and "Auto-condensation" currents.
f. "Effleuve" of the Oudin Resonator and the "Bi-polar Effleuve" of the American High-Frequency system.
g. Superimposed wave currents of various frequencies derived through the use of special electrodes and the air-gap condenser which is an exclusive feature of this apparatus.
h. Röntgen X-Rays.
i. Ultra-violet Rays for Finsen light treatments.
j. The new Multi-frequency Currents.

All of these effects are accompanied and supplemented by the wonderful vitalizing and reconstructive action of the particular variety of high-frequency oscillations which this apparatus produces.

The curative value and range of therapeutic usefulness of the combination of forces above enumerated far surpass that of any other electrical apparatus hitherto offered to the profession.

4.—SAFETY.

The current from this apparatus is always under control and may be varied from an extremely mild flow for Vacuum tube and internal treatment, to a tremendous stream of energy capable of throwing an arc over a foot in length.

While seldom used except for the heaviest X-Ray work, this maximum strength of current may be passed through the body without the slightest danger or discomfort.

No dangerous shocks are obtainable from this machine. Should the exciting current suddenly increase in intensity, the High-Frequency circuit would be automatically broken.

5.—RELIABILITY.

There is nothing to wear out on this machine, the only moving part being the spark-wheel which is spun by a small induction motor having neither brushes nor commutator.

The apparatus will run for months without readjustment, and is absolutely unaffected by outside influences, such as dampness, hot weather, thunder storms, etc. As the currents which it produces are oscillatory, no effect is produced upon watches or other delicate instruments in its immediate vicinity; in fact the tremendous arc discharge of the apparatus when operated at its maximum voltage can be passed directly through the most finely constructed watch without the slightest injurious effect.

As no glass legged insulating platform is necessary, treatment may be given at the bedside or elsewhere as desired.

Each machine is fully guaranteed.

6.—NOISE.

This is the only High-Frequency apparatus on the market that is comparatively noiseless in operation, and it is only after years of experiment and failure on the part of the inventor that this result has been attained.

7.—EFFICIENCY AND ECONOMY.

For the volume of current which it produces and the strength and penetration of its X-Rays, this apparatus consumes less energy than any other machine on the market. One or two Amperes is the usual rate of consumption, — the maximum of five Amperes being only required for the heaviest X-Ray work or for purposes of lecture demonstration.

When running continuously, the cost of operating will average five cents per hour.

The ease and simplicity of operation combined with the tremendous energy and therapeutic efficiency of this machine renders the time necessary for an ordinary treatment much less than with the Static or other form of high-potential apparatus; ten to twenty minutes being the average duration, whereas an effective Static treatment requires at least one hour.

In connection with the small amount of electricity consumed the above facts render the conclusion obvious that this is the most remunerative apparatus that a physician can purchase.

8.—REGULATION.

Despite its wonderful simplicity this machine admits of a range of regulation obtainable with no other form of High-Potential apparatus. The switch which sets the machine in operation controls at the same time the amperage or quantity of the exciting current.

The volume of the High-Frequency current admitted to the body of the patient under treatment is absolutely controlled and delicately regulated by means of the Air-Gap condenser, a device which is furnished only on apparatus constructed by the ELECTRO-RADIATION COMPANY. It forms an integral part of the unique triple terminals with which all of Dr. Strong's High-Frequency machines are equipped. By this means a variety of superimposed wave-currents are produced, the frequency and voltage of which are under absolute control (see Sec. No. 3—Versatility).

The voltage of the High-Frequency current as produced in the High-tension Oscillator is also controlled by means of the Knob "L" (see Fig. 1 on chart) which operates the variable Spark-Gap.

By this means the length and fineness of the "Effleuve" can be adjusted with great nicety, while the degree of penetration of the X-Rays from this apparatus may be regulated without altering the vacuum of the Crooke's tube.

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It will be seen in the above manner that we have entire control of (*a*) the amperage of the exciting current; (*b*) the amperage of the High-Frequency current); (*c*) the voltage of the High-Frequency current; (*d*) the voltage of the High-Frequency current which passes to the body of the patient; (*e*) the frequency and volume of the superimposed wave-currents, and (*f*) the volume and degree of penetration of the X-Rays.

9.—FIRE INSURANCE.

A clause recently inserted in the Underwriters' laws provides that all electro-medical apparatus shall be inspected and approved before a permit can be obtained for their installation on an electric light circuit.

Our machines are the only ones on the market that have been officially approved by the Board of Fire Underwriters.

10.—X-RAYS.

While Dr. Strong's apparatus has been designed with a view to the production and convenient therapeutic application of High-Potential electricity, its performance as an X-Ray machine is equally remarkable.

This point is strikingly illustrated by the fact that a number of physicians who do not employ electricity therapeutically are using our apparatus exclusively for Skiagraphy and Radiotherapy.

At the present time three types of apparatus are employed for the generation of the X-Ray, viz.:

a. The Static machine.

b. The Rhumkorff Coil, with Mercury Turbine, or Electrolytic interrupter.

c. High-Frequency Apparatus excited by alternating current-transformers.

a. The popularity of the Static machine is on the wane; both as an electro-therapeutic instrument and as an X-Ray generator it is cumbrous, inefficient and uncertain. Its X-Rays are of small volume and great difficulty is encountered in regulating the vacuum of the Crooke's tube to obtain different degrees of penetration. It is no longer seriously considered as an X-Ray apparatus.

b. The Rhumkorff Coil is generally regarded as the most satisfactory instrument for the generation of the X-Ray; for the heaviest

truly wonderful curative action on certain refractory skin diseases, notably acne and eczema.

The rays from the new lamp are steadier, more intense, and more easily applied than in any other instrument yet offered to the profession for the generation of this valuable form of vibratory energy.

"THE HERCULES SPECIAL."

This Machine is designed for those who wish to provide themselves with an apparatus having the same power and range of usefulness as the "HERCULES" but who do not care to put quite so much money into an Electro-therapeutic outfit.

It is a "HERCULES" machine, but the cabinet is smaller and the mountings somewhat less elaborate than in the standard apparatus. The case is of quartered oak handsomely panelled on all sides. The terminals are supported upon onyx columns, mounted upon a heavy base of polished plate glass, as in the "HERCULES." This, in turn, rests upon an oblong case of quartered oak fixed to the top of the cabinet and containing the Tesla coil. The rotary spark-gap is mounted in a compartment having a plate glass door as in the larger machine. This apparatus presents a very handsome appearance, being second only to the "HERCULES" in beauty of design and finish.

Price of the HERCULES SPECIAL.

For 104 volt alternating current, without accessories .	$350.00
For 110 volt direct current	$400.00
Electrodes, X-Ray outfit and Ultra-violet Lamp, (when purchased with the machine) . .	$50.00

"THE PORTABLE HERCULES."

Standard Portable High-Frequency and X-Ray Apparatus.

The ELECTRO-RADIATION COMPANY introduced this machine to the profession about a year ago, and it has been employed by a number of physicians, who testify to its wonderful convenience

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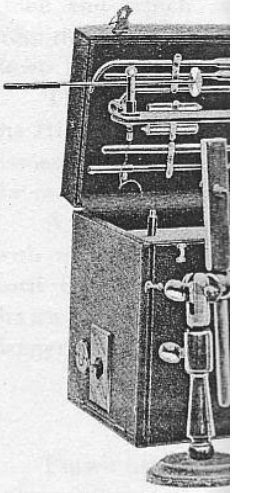

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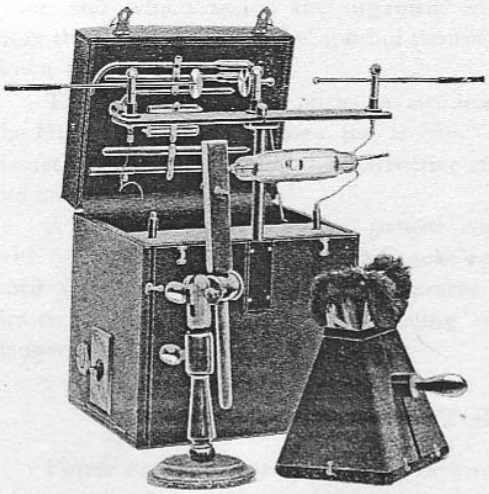
and therapeutic efficiency. As its name indicates, it is practically a miniature reproduction of the "HERCULES," and possesses the same wide range of usefulness, the only difference being in the strength of the current produced. The output is, however, ample for all forms of High-Frequency treatment and for the general run of X-Ray cases. A good fluorescopic picture of the thorax can be obtained, the cardiac pulsations being plainly visible.



"PORTABLE HERCULES" (open).

This is not a cheap machine. It is designed for discriminating practitioners who can appreciate a well made apparatus. In order to confine the tremendous energy of a Tesla current in such a small space it has been found necessary to employ the most expensive materials and to use the greatest care in the assembling of the parts. The apparatus is "made like a watch," and will run continuously for hours without the slightest fluctuation or diminution in the efficiency. This is accomplished by the use of a rotary spark-gap, which is a miniature duplicate of that used in the "HERCULES." The little motor which rotates the spark-wheel has been made especially for the above purpose, and is the smallest Alternating Current induction motor ever constructed. Hundreds of dollars have been expended in the perfection of this instrument alone, and equal care and study have been given to the other parts which enter into the construction of the "PORTABLE HERCULES." Ultra-violet Rays from this machine are fully equal to those produced by its larger prototype, and practically the same therapeutic results may be obtained with it at the bedside as with the larger apparatus in the office. It is always ready for immediate use, being attachable by a cord and plug to any convenient incandescent lamp socket. It requires no renewal of parts or frequent adjustment, is compact and durable, and is fully guaranteed.

skiagraphic work, such as photography of Pelvic tumors, hip joints in adults, etc., it is undoubtedly the most reliable means for exciting the Crooke's tube, but for the general run of X-Ray cases it is many ways inferior to a modern High-Frequency Apparatus.

It consumes more current in proportion to the strength of X-Rays produced, necessitates a considerable technical knowledge on the part of the operator, and its Crooke's tubes require re-exhaustion much more frequently than with the apparatus which we manufacture.

A Rhumkorff Coil if operated with an electrolytic interrupter is very noisy, trouble is experienced with heating of the liquid, acid fumes, etc., and the consumption of platinum is a considerable factor in increasing the expense of operation.

A Mercury Turbine Interrupter, on the other hand, requires frequent cleaning, the mercury must be washed and filtered at intervals and renewed every few months.

With the Rhumkorff Coil, tubes are often spoiled by random sparks which puncture the glass and destroy the vacuum, while with Static machines unpleasant and irritating brush discharges are given off from the tube terminals, causing annoyance to the patient.

Crooke's tubes must be provided with water-cooling devices or heavy platinum anodes in order to withstand the high amperage of a Rhumkorff discharge. This increases their cost materially.

The Strong High-Frequency-Apparatus gives a greater strength of X-Ray per unit of electricity consumed than any machine on the market. The rays are absolutely steady and continuous, the degree of penetration is under absolute control (see Sec. 8—Regulation), and by means of the Air-Gap Condenser embodied in the terminals a tube can be held at any desired degree of vacuum during hours of continuous operation.

A punctured tube from a stray spark is almost unheard of in the annals of this machine, and the small amount of heat liberated at the anode allows of the use of lighter terminals, making the cost of the tube about one-half as much as a good Rhumkorff tube.

The inventor of our apparatus has a tube which has been in hard use for over two years without re-exhaustion, and it is still in service.

For Radiotherapy this machine is unsurpassed, curative effects having been obtained which would have been impossible with any other form of apparatus. This is due to the fact that the destructive effect of the X-Ray is reinforced by the vitalizing action of the High-

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Frequency Effleuve which always accompanies the rays from our machine and which assists the organism in absorbing and removing from the diseased area the morbid tissues which have been broken down by the X-Ray.

The danger of X-Ray burns is also lessened from this cause, as the High-Frequency increases the trophic influence in the normal tissues without diminishing the destructive effect of the X-Rays upon the morbid elements.

A severe shock results if a patient comes in accidental contact with one of the wires connecting a Crooke's tube to a Static or Rhumkorff Coil, but with the Strong Apparatus painless sparks may be drawn from the tube or its connecting wires without the slightest danger or unpleasantness.

11.—ULTRA-VIOLET RAYS.

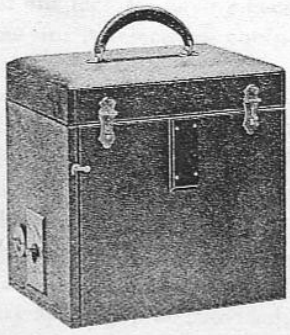
Finsen has demonstrated that the rays of the sun or of the electric arc exert a powerful curative action upon certain skin diseases, notably lupus and epithelioma. Görl, Piffard and others have shown that this effect is produced for the most part by the invisible rays beyond the violet of the spectrum—the so-called "Ultra-violet Rays." These consist of transverse ether-waves or vibrations ranging from 750 to 10,000 million-million vibrations per second. They are beyond the range of human vision but have the property of disturbing the atoms in certain unstable chemical compounds such as silver bromide, and some of the highly organized substances which form the tissues of the body.

It is to the Ultra-violet Rays rather than to the slower light vibrations that the effect known as "sunburn" is largely due. Finsen used the rays from an 80-Ampere arc lamp, filtering out 90% of the energy in the form of heat and red light in order to isolate the Active Violet and Ultra-violet Rays.

In the "HERCULES" Apparatus Ultra-violet Rays are generated by the discharge of a condenser between iron electrodes contained in a perfected form of Görl lamp recently designed for the ELECTRO-RADIATION COMPANY by Dr. Strong. With this equipment Ultra-violet Rays of great intensity are obtained almost free from red and yellow light and heat waves.

By removing the quartz lens with which the lamp is provided we obtain in addition to the Ultra-violet waves, the "Spark-Gap Rays," recently described by Dr. Piffard, which have been shown to exert a

When the invention of the apparatus was first announced there were no portable X-Ray and High-Frequency machines on the market. Since that time at least half a dozen have been brought out by different manufacturers, all more or less similar in principle, but none of them as compact and efficient as the "Portable Hercules," which is arranged to carry a full set of electrodes, Crookes' tube, Folding fluorescope and Ultra-violet Lamp in the same case which contains the High-Frequency apparatus. In other so-called portable machines extra carrying cases are employed for the Crookes' tube, Fluorescope, Rheostat, etc., and considerable time is required to assemble and connect the various parts of the apparatus. In the "Portable Hercules," on the contrary, it is only necessary to insert the terminal post in the socket and connect the Crookes' tube or electrodes and the machine is ready for instant use.



"PORTABLE HERCULES" (closed).

This apparatus is permanently assembled in a handsome seal leather covered case, 15 x 13 x 11, and weighs with accessories about 35 pounds. It contains a full set of vacuum and "effleuve" electrodes, Crookes' tube, Fluorescope and Ultra-violet Lamp. On the 104 volt alternating current the machine consumes from ½ to 3 amperes.

Price of "PORTABLE HERCULES."

For 104 volt alternating current, (complete as above) . $250.00
For 110 volt direct current $275.00

(If the X-Ray outfit is not desired deduct $25.00 from the prices).

DIMENSIONS. — Width, 13 in.; depth, 11 in.; height, 15 in.

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COMBINATION-PORTABLE AND OFFICE APPARATUS.

The Ideal Apparatus for the General Practitioner.

Affording the convenience of the "PORTABLE HERCULES" with the handsome and impressive appearance of the "AJAX" cabinet machine.

This outfit consists of a "PORTABLE HERCULES" slightly modified, which fits inside of a handsome oak cabinet provided with large triple terminals (see cut) connected by cables through insulated bushings in the cover. Apertures are provided in the side of the cabinet for the switch handle and connecting cord. Externally there is nothing to indicate that the machine is not a permanent office fixture to the Tesla coil of the portable machine. For bedside use and treatments outside of the office it is only necessary to disconnect the terminal cables, remove the apparatus from the cabinet, pack the electrodes and folding terminals in their compartment, and close the case.

This is the only combination portable and office High-Frequency apparatus on the market. Its many advantages are obvious and we predict that it will be promptly adopted by the leading general practitioners.

The Complete Outfit Comprises:

One special "PORTABLE HERCULES" with accessories, as enumerated on page 16.

A handsome quartered oak cabinet arranged to contain the High-Frequency apparatus when used as an office machine.

A set of triple terminals with marble pillars, permanently mounted upon the top of the cabinet.

Price of Combination Apparatus as above.

For 104 volt alternating current $300.00
For 110 direct current $350.00

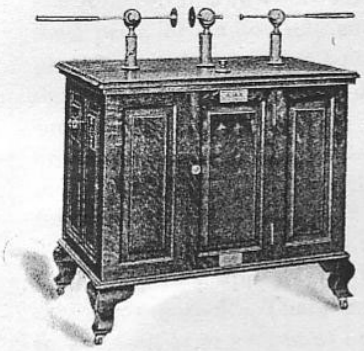
DIMENSIONS. — Length, 2 ft.; width, 2 ft.; height to top of terminals, 3 ft.

(In the direct current outfit a larger cabinet is provided to contain both the "PORTABLE HERCULES" and the "Rotary Converter.")

"THE AJAX."

This machine is the latest production of our factory, having been designed during the past year; the formulae for its electrical equipment were furnished us by Dr. Strong.

It embodies certain new principles and is simply and substantially constructed. It comprises a self-regulating transformer, a condenser, and a Tesla coil, all of improved design and mutually adapted and attuned for the efficient generation of High-Frequency currents. A new form of stationary spark-gap is provided, which requires but little adjustment. By its peculiar construction it acts as a perfect valve for the High-Frequency current which may be regulated by this means from a discharge one inch in length to a flaring arc from six to ten inches long. It is this feature of Spark-Gap Regulation which has enabled us to do away with the expensive multiple switch and variable inductance which are used in the "HERCULES" machine.



The performance of the "AJAX" is almost equal to that of the "HERCULES" except as regards length of "Effleuve" and strength of X-Ray. No stationary spark-gap ever made will give the absolutely smooth and continuous current obtained in the "HERCULES" by the use of our patent Rotary gap, but the new Discharger, which we have designed for use in the "AJAX" machine operates in a very satisfactory manner and is superior to any other gap of its class. The spark occurs between a rounded copper point and a disc composed of an alloy of platinum and silver, and will operate for months without cleaning. The Tesla coil is mounted in the cabinet, directly under the marble pillars which support the heavily plated terminals. The latter are similar to those of the "HERCULES" but of slightly smaller size. The "AJAX" is a most efficient machine, consuming from one to three amperes under ordinary conditions, and being absolutely unaffected by moisture and changes in temperature. The Cabinet is of quartered oak handsomely panelled on all sides. Owing to its greatly improved and simplified construction we are able to offer

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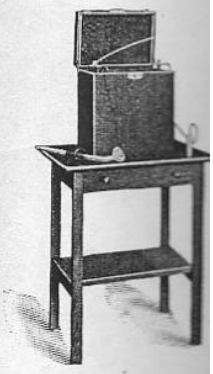

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the "AJAX" to the profession at a price which is considerably lower than any other apparatus of equal efficiency on the market.

Price of the "AJAX" MACHINE.

For 104 volt alternating current, with set of vacuum and metal electrodes $150.00
For 110 volt direct current $200.00
X-Ray and Ultra-violet outfit (when purchased with the machine) $35.00

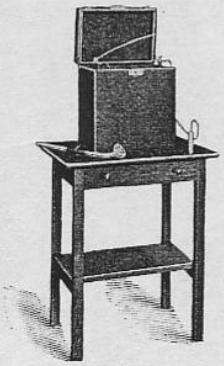
DIMENSIONS — Length, 3 ft.; height to top of terminals, 38⅛ in.; width, 20¼ in.

"THE AJAX JR."

A PORTABLE SELF-EXCITING HIGH-FREQUENCY APPARATUS.

The Only Portable Tesla Apparatus Ever Offered to the Profession Which Operates on Its Own Battery Power.

This instrument is Dr. Strong's latest contribution to High-Frequency therapeutics and is regarded by him as one of the most important of his inventions. We believe that it is destined to bring High-Frequency currents into universal use in the medical profession.



Being portable, self-contained, and above all self-exciting, this apparatus may be applied in any place or under any condition. It is equally valuable in the office or at the bedside. Its therapeutic efficiency is truly remarkable, the same effects being obtained as with the larger machine except that the action is less powerful. It is far superior, however, to the High-Frequency coils which are sold as attachments to static machines, and it produces true Tesla effects, the discharge across its spark-gap being practically continuous.

The same care is exercised in its construction as in the "PORTABLE HERCULES" and it is fully guaranteed against break down. Its condenser and Tesla coil are practically the same as in the above machine, but being

used at lower voltage they can be constructed in a less expensive manner. The transformer is of the Ruhmkorff type and is especially wound for the purpose. It is provided with a compound vibrator which is almost noiseless and will run indefinitely without attention. The transformer is energized by dry cell batteries. To obtain the full efficiency of the apparatus it is essential to employ the special 8 volt dry battery which we have designed for the purpose, and which just fits the compartment in the machine. It may be removed and replaced in a few seconds. We furnish these compound cells at a net price of $2.00 each, and as they will operate the coil for a period equivalent to from 50 to 75 ordinary treatments, it will be seen that the cost of maintaining an apparatus of this kind is extremely small. In an emergency the special battery may be replaced by four ordinary dry cells, but the results are not the same, and we cannot guarantee the apparatus unless it is used in accordance with our instructions.

This machine resembles the "PORTABLE HERCULES" in size and general appearance, weighs about 30 pounds, is compact and easily transported. There are no delicate parts and practically nothing to wear out or to get out of order. Clinical tests on a large number of cases have given results almost equal to those obtained with the larger machines. Efficient vacuum, condenser, spark, and wave-current treatments may be readily given and the special form of air-gap condenser enables the physician to produce muscular contractile effects superior to those obtained with a sinusoidal or other low-frequency apparatus.

Geissler tubes, and even small incandescent lamps will illuminate from the energy drawn through the human body from only one pole. This is a test which can be produced only from an apparatus generating a true Tesla High-Frequency current.

The spark-gap of the condenser circuit in this machine produces Ultra-violet rays which will brilliantly fluoresce Willemite and other sensitive substances.

Price of the "AJAX JR."

With full set of vacuum and hand electrodes, Geissler tube, cord, etc., including one extra 8-volt dry battery . $75.00

Extra 8-volt compound dry cells, each, . . . $2.00

DIMENSIONS. — (Without stand), height, 12 in.; length, 12 in. width, 8 in.

FEB 14 1896

The Roentgen Rays

Their Production by Static Generators and Methods of Application

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THE ROENTGEN RAYS

THEIR

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Published by the

AMERICAN ROENTGEN RAY COMPANY

BOSTON, MASS., U. S. A.

1897

Press of Louis F. Weston

Cambridgeport

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QC 481
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Charles F. Warner, Cambridge, Mass.
October, 1897

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INTRODUCTION.

This pamphlet is addressed to any person who may be interested in the subject of the Roentgen rays and the approved methods of producing and making use of them. It presents the claims of a form of static machine which has had a successful trial of more than a year, and which stands to-day, all things considered, as the most practical high voltage generator yet produced, suited not only for use with Crookes tubes but also for all purposes for which static machines are employed. It describes also the latest improvements in all x-ray accessories, and gives some suggestions upon the methods of applying the x-rays to examinations for surgical and medical purposes.

The plates are illustrations of work done by the "Standard" New Holtz Machine as used in the laboratory of the Cambridge Manual Training School, covering a wide range of cases about three hundred in number. In no case has the time of exposure been hastened, as is often done, by fluoroscopic sheets placed upon the photographic plates. All are examples of genuine x-ray photography. For such parts as the hand and arms the time of exposure has been from one to three minutes; for the knees, three to ten minutes; for the trunk, ten to thirty minutes. Fluorescent screens, in certain exposures, will reduce this time almost to as many seconds.

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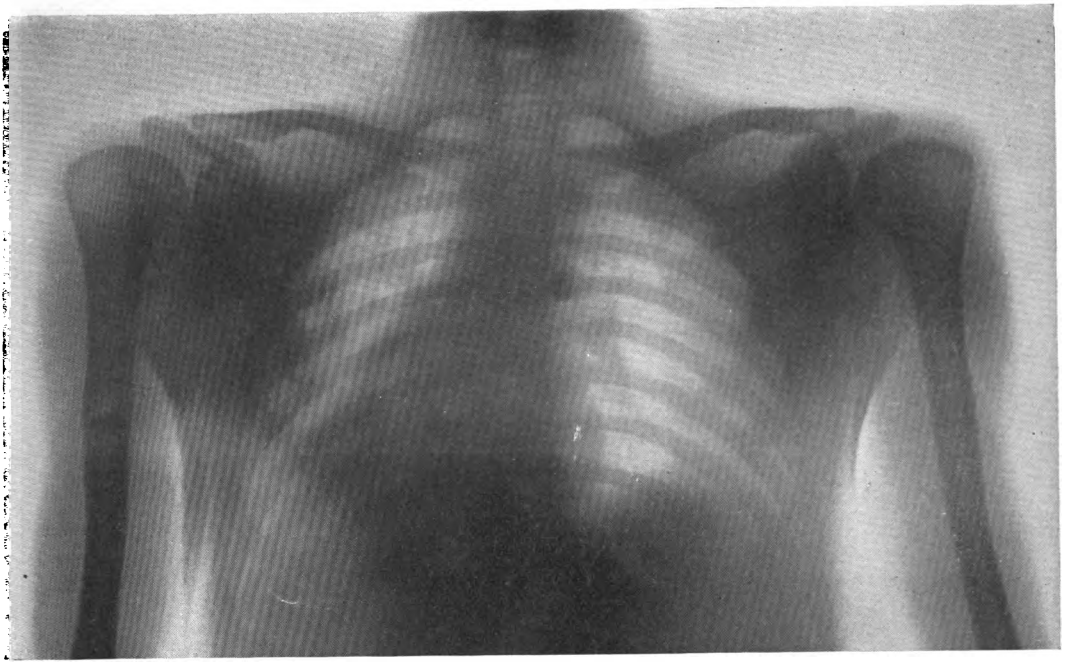
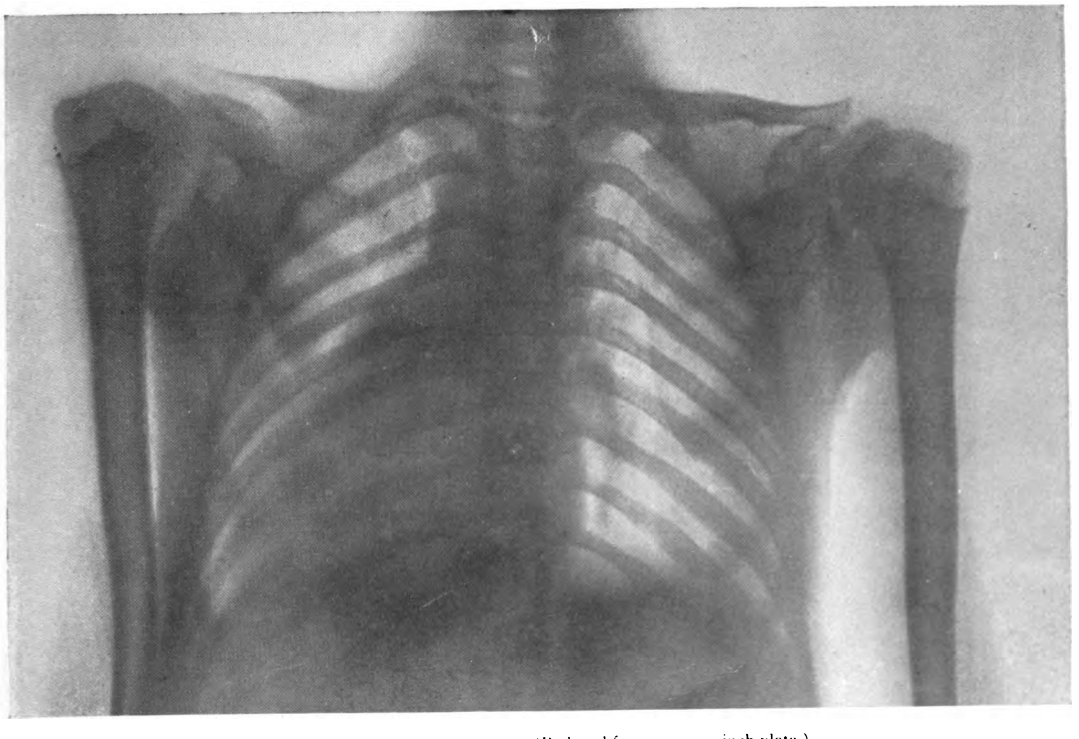


THORAX OF AN ADULT.

Copy of an x-ray skiagraph made June 14, 1897, on a 20 x 24 inch plate using the "Standard" New Holtz Machine. An equally satisfactory skiagraph of the pelvis of the same subject has been made.



THORAX OF A BOY, 13 YEARS. (Reduced from a 14 x 17 inch plate.)

Copy of an x-ray skiagraph of a youth's back and shoulders, made July 24, 1896, in the laboratory of the Cambridge Manual Training School, the Crookes tube being excited by the New Holtz Machine at a distance of 2 feet from the plate. The heart and other opaque vital organs were badly defined on the photographic plate on account of motion; but they appeared distinctly upon the fluoroscopic screen.

PLATE I.

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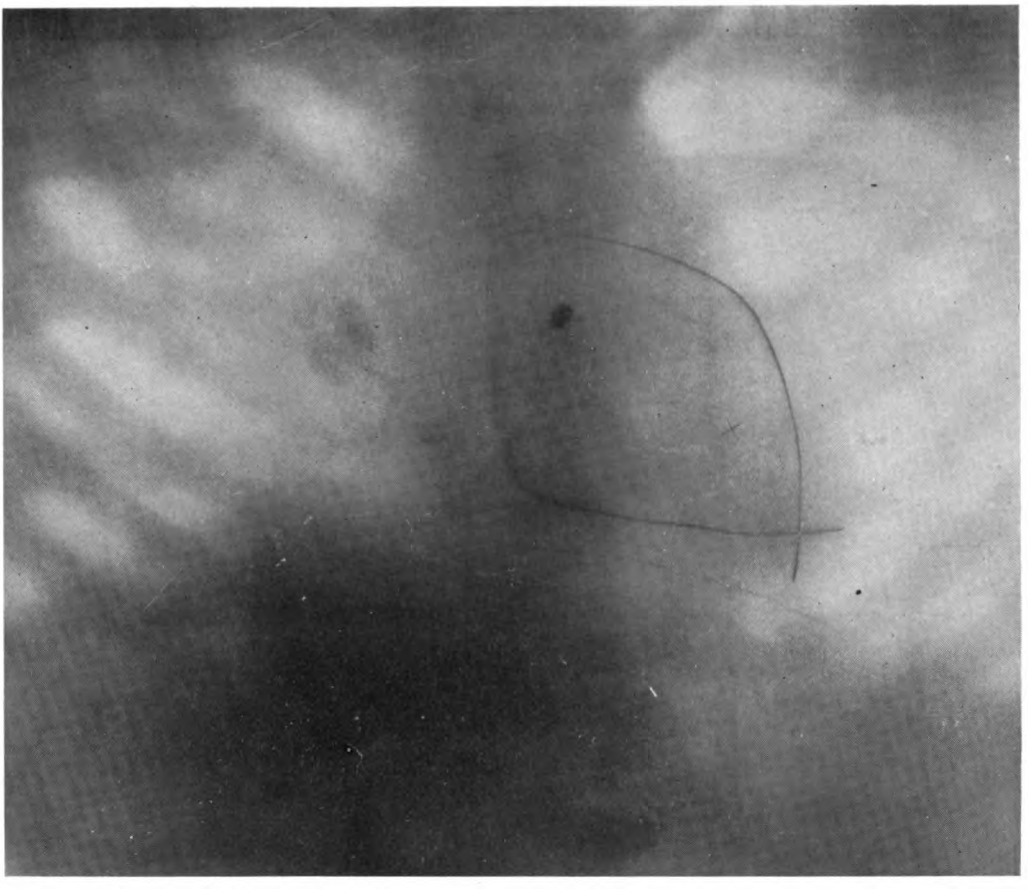

BULLET NEAR THE HEART.

This is a case of unusual interest. The bullet, fired from a 32 calibre revolver at close range, entered the anterior chest-wall near the apex of the heart, at the point marked with a cross, was deflected by the rib and lodged against the posterior aspect of the gladiolus, slightly to the right of the median line. The wire outlines the position of the heart and area of cardiac dullness. The bullet could not be traced by probing and was located by the "Standard" New Holtz Machine, notwithstanding its position required the penetration by the x-rays of three comparatively opaque substances, viz.: the vertebræ, the heart and the breast bone. The ill defined shadows of the ribs are due to the movements of the patient and the nature of the exposure. This case, with others, is fully described in Annals of Gynæcology and Pædiatry, February and April, 1896. It was from the Cambridge City Hospital, Drs. Taylor and Henshaw.

PLATE II.

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THE ROENTGEN RAYS

And the Conditions Necessary to Produce Them.

I. Probable Nature of the Roentgen Rays.

Real nature not known.

Very little is positively known about the nature of the x-rays of Roentgen. Experimenters have learned much about the properties of this wonderful agency, its uses, the conditions necessary for its production and the various methods of application; but the real nature of the transformation which takes place within the Crookes tube, while it is sending forth the x-rays, is still as much a matter of hypothesis as it was when Roentgen first announced his now famous discovery. A full discussion of the subject would be foreign to the purposes of this pamphlet; but a passing reference to one or two points in the dominant theory may not be out of place.

Are probably very short ether waves.

From the first, scientists have generally agreed that the Roentgen rays are probably due to a wave motion in the ether, in kind not essentially unlike light waves, which Hertz and others have proved to be electrical. They are known to differ from ordinary light waves principally in being much shorter and of much higher frequency than any waves hitherto observed. According to the measurements of Fomm, the Roentgen rays, although they undoubtedly vary considerably in length, have in general about one-fifteenth the wave length of ultra-violet light. Before the publication of these results Dr. Oliver Lodge expressed the belief that the x-ray wave length, when determined, would be found to be much shorter than the shortest waves of the spectrum and, indeed, comparable with atomic dimensions. The observed parallel between the relative transparency to x-rays of certain substances and their atomic weights rather than their specific gravities is perhaps worthy of note in this connection. Roentgen's original suggestion that the direction of vibration in the new rays may be along the line of wave propagation instead of being at right angles to it, in other words longitudinal instead of transverse, as it is in ordinary light waves, remains still open to question. No observations have been reported either as opposing this hypothesis or as a sufficient foundation for it.

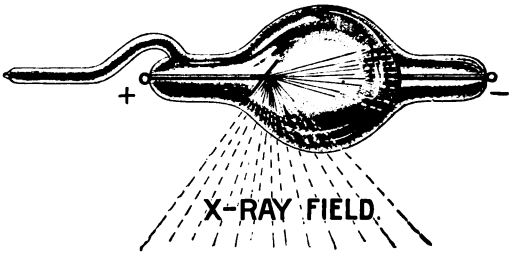
II. Crookes Tubes.

Apparatus required for modern skiagraphy.

Turning to the practical side of this subject we find that two pieces of apparatus are essential for the production of Roentgen rays, — first, a properly constructed Crookes tube, and second a suitable source of electricity in the form of the disruptive discharge. Some of the special requirements which must be met by apparatus designed to secure the best results in skiagraphy according to modern standards will next be explained.

Source of the Roentgen radiation.

The real nature of the action which goes on in a Crookes tube when producing x-rays, as has already been stated, is unknown, but it may be positively asserted that some small area within the tube, which receives that mysterious force emanating from the negative terminal or cathode, becomes the source of the Roentgen radiation. In modern tubes this source is a very small portion of the surface of a piece of platinum foil attached to the positive terminal or anode of the tube, or suspended in front of the anode without electrical connection. With regard to the peculiar action of the cathode just referred to, it may be well to say that about twenty years ago Crookes



Cathode rays.

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discovered that when an electrical discharge is passed through the so-called high-vacuum tubes, a form of energy is developed at the cathode terminal which seems to throw out a stream of some sort from the surface of the cathode in lines perpendicular to it. The direction of these cathode rays was observed to remain normal to the surface of the terminal from which they were thrown out, whatever angle that surface might present to the line of direction of the current through the tube. It was therefore possible, by changing this angle, to throw the rays in any direction and, by using a concave disc for the cathode, to focus them upon any point. They were shown to cause mechanical motion, heat and fluorescence, and to be deflected by magnets.

In order to produce the cathode rays, which are a necessary condition for the generation of the Roentgen rays, it is essential, as is well known, that a very high degree of exhaustion be obtained in the vacuum tube. Ordinary vacua, such as serve for incandescent lamps, will not do because they are too low; and, on the other hand, the exhaustion must not be carried to the highest degree practically attainable, for, in that case, the resistance of the tube will become so high that sufficient current cannot be forced through it to produce the desired effect. An exhaustion to about one-millionth of an atmosphere is generally conceded to be the proper condition so far as it is possible to express it in figures. But in reality it is a matter of careful experimental adjustment, rather than of exact measurement. Experience in the use of vacuum tubes for x-ray generation has shown that slight variations in the tenuity of the residual gas, even after the required exhaustion has been reached, alter the character of the rays and thus modify the results obtained by their use. Indeed, this point is of the greatest practical importance in skiagraphy. In pumping tubes it is observed that, when the vacuum is at the lowest state at which it is possible to produce x-rays at all, the flesh of the hand and fingers casts a dark shadow upon the fluoroscopic screen, the bones being entirely invisible. As the pumping proceeds, the flesh gradually loses its opacity and the bones appear, — at first dimly and with ill-defined outlines, then more clearly until, finally, they become distinct and well defined in the faint shadow of the flesh around them. For a tube intended only for use with the hand and thinner parts of the body we should stop here and, if possible, maintain the exhaustion at exactly this degree. But a higher penetrating power is desirable for examinations of such thicker parts of the body as the knees, shoulders and trunk. This is accomplished by producing a slightly higher degree of exhaustion. Such a tube as is suited to this latter purpose, however, would give a weaker skiagraph of the hand, because the rays thrown off by it would penetrate the thinner bones of the hand almost as readily as the flesh. A tube may be exhausted to such an extent that, when driven with a powerful coil, it will render the bones of the hand only faintly visible on the fluoroscopic screen or the photographic plate. Such a tube, even if a generator of sufficient power to force a current through it is accessible, is nearly or quite useless for Roentgen ray photography. Desirable tubes are those properly constructed and exhausted to a degree suited to the character of the work they are expected to do.

A nicely adjusted vacuum necessary.

Variation in the penetrating power.

Since the introduction of the so-called focus tube, the first great improvement, designers have been busily employed in devising ways to secure a proper condition of vacuum, durable and capable of easy adjustment; for it was universally recognized that along this line the next great step in advance was to be taken. The importance of this matter lay not only in the desirability of having a tube properly adjusted to the work demanded of it, but also in economical considerations. In use, especially with coils, tubes run up so high, even in a single examination sometimes, as to become useless. Such a result has been ascribed to the occlusion of some of the residual gas by the walls of the tube and by the terminals against which the gaseous particles have been driven by the discharge within the tube. It may be corrected in a measure, generally, by heating the tube reasonably hot over a Bunsen or alcohol flame. But this is not a thoroughly

How the nature of the vacuum may be controlled.

By heating.

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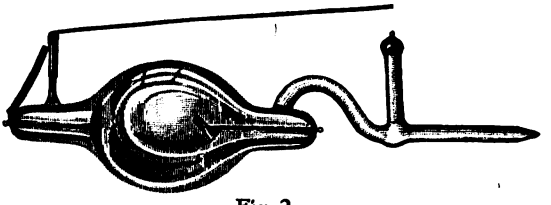
satisfactory method. The use of large tubes, which must contain a considerable store of residual air to start with, has been an improvement, as also have been smaller tubes with attached reservoirs. But these all run up sooner or later and require re-exhaustion. Another method of controlling the vacuum is that employed in the Bowdoin College tube. In addition to other unique features this tube has a fluorescent substance deposited upon its interior, which is designed to reinforce the vacuum when it becomes too high. The latest device, and one which seems to be very successful, is the so-called self-regulating tube. The operation of the regulating device depends upon the increase in the resistance of the vacuum as it runs up in use. There are several forms, the simplest of which is illustrated in Fig. 2. The end of the movable arm is set at any required distance from the small bulb which opens into the tube near the anode terminal. This bulb contains a substance from which a vapor is readily thrown off when a spark is passed through it. Now when the vacuum of the tube has increased, so as to make its resistance higher than the resistance of the air between the end of the movable arm and the terminal of the bulb, the current takes the path of lesser resistance and sends a succession of sparks across the gap. This causes a vapor to be thrown off from the substance in the bulb and thus furnishes the needed reinforcement to the residual gas in the tube. The resistance of the tube being thus brought back to its normal condition, the current returns to its original path through the tube, restoring it to its proper function. The spark-gap of this tube can be easily varied in length. By this means the vacuum is not only self-regulating but adjustable, within certain limits.

By using large tubes and reservoir tubes.



By an interior coating.

Fig. 2.

Self regulating tube.

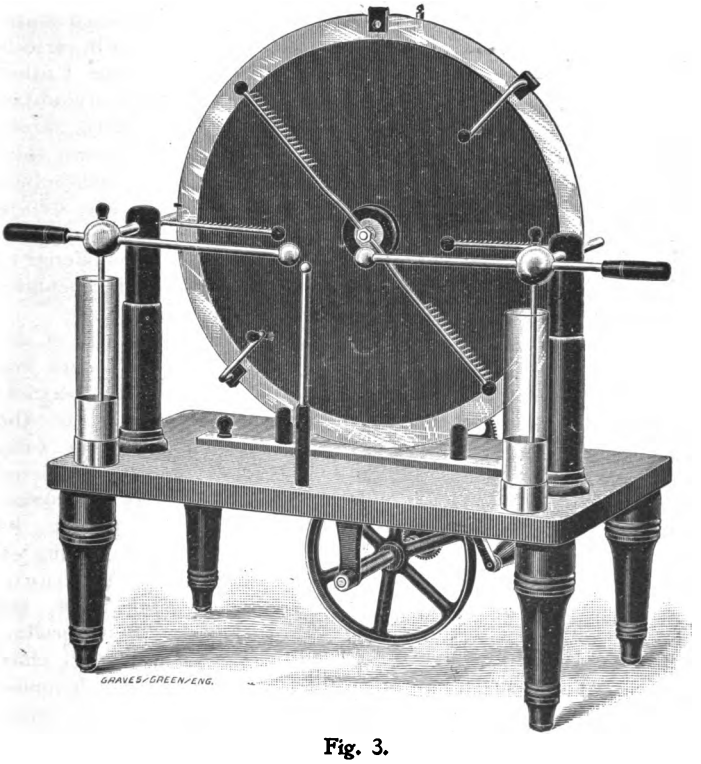


Fig. 3.

Adjustable spark-gap.

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ONE OF OUR MANY TESTIMONIALS.

THE WAVERLY TRAINING SCHOOL,
WAVERLY, TENN., July 6, 1897.

Mr. Charles F. Warner,

DEAR SIR:—I desire to write you and tell you of the wonderful success I achieved with the tube you sent me. I have used it for three heavy exhibitions, and it is apparently as good as ever. It gave the most beautiful results, throwing out a strong light, which enable one to see through the chest, an international dictionary, and to discern the shadow of a piece of metal through the head. This last was quite plain. I have had one fifteen dollar tube, and have seen others, but this was superior to any of them.

Yours truly,

W. E. MILLER.

III. STATIC GENERATORS AND ROENTGEN RAY PRODUCTION.

Success of the New Holtz Machines.

The first successful static machines designed especially for Roentgen ray production were put upon the market in October, 1896, by Mr. F. O. Stanley of the Stanley Dry Plate Co., Newton, Mass., and by Mr. Charles F. Warner of the Cambridge Manual Training School. Brief as the time of trial has been, they have demonstrated their high efficiency for use with Crookes tubes, as well as for all other purposes for which static generators are employed, through the varying climatic changes of an entire year in various sections of the United States; and, on account of their convenience, safety and inexpensiveness, they have placed themselves in the front rank among the several types of electrical machines offered to purchasers of Roentgen ray outfits.

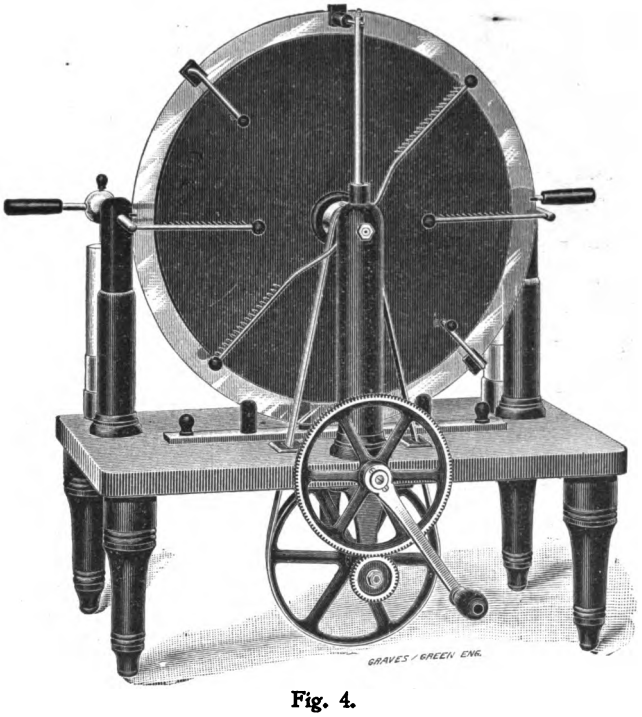

Fig. 4.

Why static discharge is superior to all others.

The superiority of the discharge from static machines for the peculiar requirements of the Crookes tube in x-ray generation was suspected from the first on account of its high tension, its freedom from heating effects and consequent economy of tubes, the simplicity of its production, its oscillatory character, and the suddenness of its interruptions. These admitted properties of static discharges, together with the successful experience of the past year, justify us, we believe, in recommending the New Holtz Machines in the highest terms. In this belief we are also supported by the opinions of many disinterested experts. We will mention a single authoritative statement which appeared in the *Medical Record* (New York) for June 26, 1897, page 903, in an article by S. H. Monell, M.D. The statement is as follows:—

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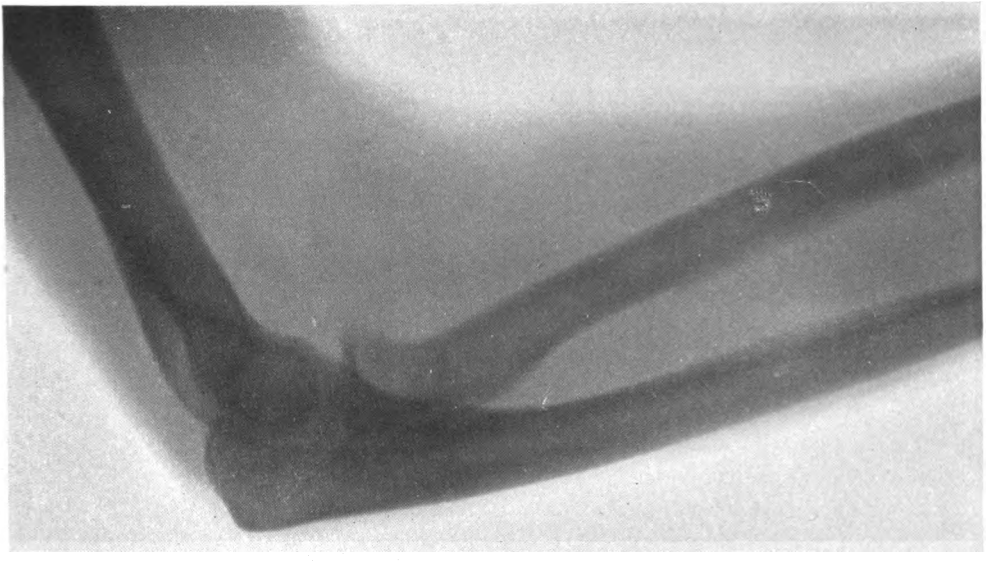

An elbow examined for fracture and none found.

Copy of a skiagraph of a pelvis; reduced from a 14x17 inch plate.

PLATE III.

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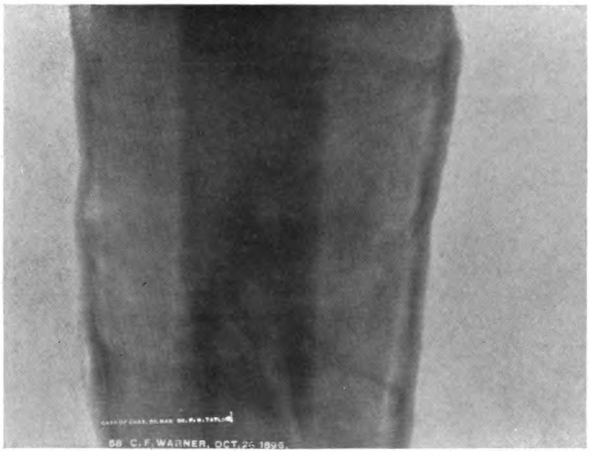
1. Apparent Greenstick fracture.

2. Another view of the same.

(Illustrating the necessity of two views in x-ray examinations).



3. Fractured tibia: limb in plaster cast.

4. Supernumerary bone in foot.

A Group of Surgical Cases.

(Illustrating important uses of x-ray examinations).

PLATE IV.

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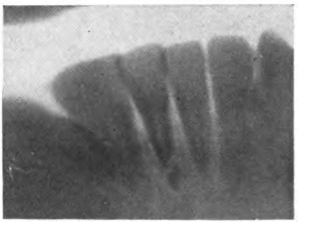
1

2

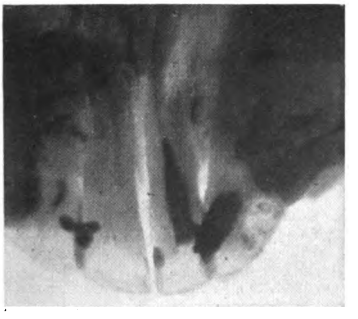
Imbedded cuspids with retained temporary cuspids; girl, 21 years.
No. 1. Right side. No. 2. Left side.

Imbedded cuspid with retained temporary cuspid; patient 23 years of age

Permanent teeth pushing out temporary teeth; boy, 8 years.



Fracture at tip of the root of inferior central, caused by a blow from a polo mallet.



Fillings, some extending into the root.

1

2

Drill in jaw tissue. No. 1 shows it emerging apparently from pulp cavity; No. 2, taken at a different angle, shows it to be between the roots of central and lateral. It was successfully removed after having been in the jaw more than a year, causing severe abscess.

COPIES OF DENTAL SKIAGRAPHS.

These interesting exposures were made principally by Dr. Dwight M. Clapp, of Boston, using the "Standard" New Holtz generator. They illustrate an important application of Roentgen radiography in dental diagnoses.

PLATE V.

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(1) A fractured ulna.
(2) A hand: skiagraphed in one minute.
(3) Left foot, naked.
(4) Right foot of same person, in a pointed shoe.

PLATE VI.

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"The Holtz Machine with tubes adapted to its maximum discharge will readily and economically equal or surpass the best x-ray effects producible by any or all other means of electrical excitation with any design of tubes that can now be obtained."

IV. Specific Features of the New Holtz Machines.

In order to explain definitely the claims on which we base our recommendation of this type of electrical generator for the production of x-rays, we will describe their special features in detail. Most of the forms of static machines existing when the problem of the New Holtz was undertaken were unable to produce discharges of sufficient power and frequency to maintain an x-ray tube in action; and those that were able to do the work were too cumbersome and too expensive to be practical. The mechanical design of these older machines was such that powerful discharges could only be obtained by using a large number of plates, on account of the slow rate of motion attainable. To overcome this defect Mr. Stanley conceived the idea of so designing a machine that it would be practicable to employ a *high rate of speed in the revolving plates and thus make one or two do the work generally done by five to ten times that number.* This was successfully accomplished by using two rubber revolving discs, 17 in. in diameter, mounted on ball bearings and driven by a set of gears so that a speed of 2,000 to 2,500 revolutions per minute could be easily obtained. The accompanying figures will illustrate the simple mechanism employed to produce the desired speed.

High speed the essential feature.

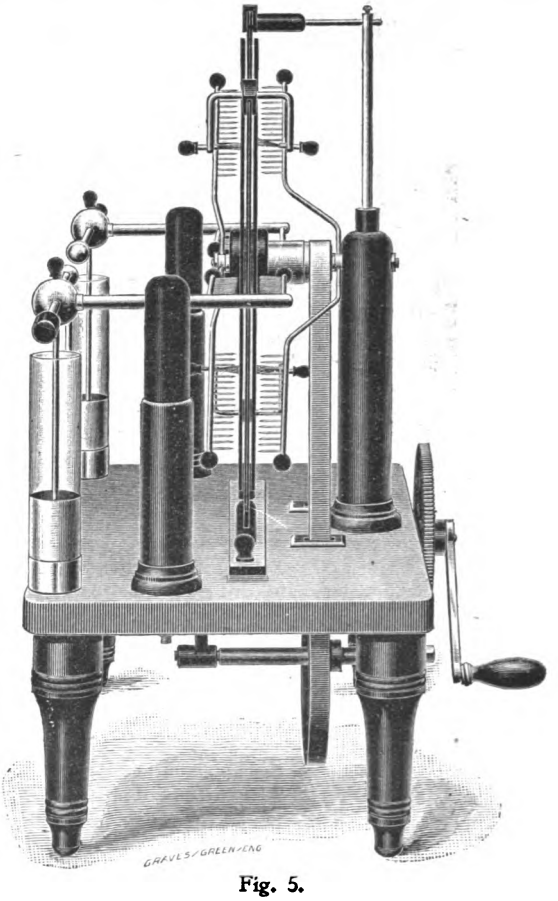

Fig. 5.

Other specific features.

Other unique features of this design, which were developed by careful experimenting, may be summed up briefly as follows:

1. The use of specially vulcanized rubber in the discs, which prevents warping; and a special preparation of the surfaces.
2. Two armature plates of the highest specific inductive capacity, coated with a varnish of uncommonly great insulating power.
3. A case to protect the essential parts from dust and moisture.
4. Light running parts and a belt that cannot slip.
5. General mechanical firmness and durability combined with light weight.

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6. Easy adaptability to various forms of motive power though designed to be run by hand.

7. Low first cost and small cost of maintenance.

Three elements of special value have been established by a year's experience with the New Holtz machines:—

Efficiency.

1. They give a torrent of oscillatory discharges of great volume and constant potential, easily held at the maximum, and capable of exciting Crookes tubes powerfully and producing results never inferior and often superior, in depth and definition, to those given by the various methods employing the dynamic current.

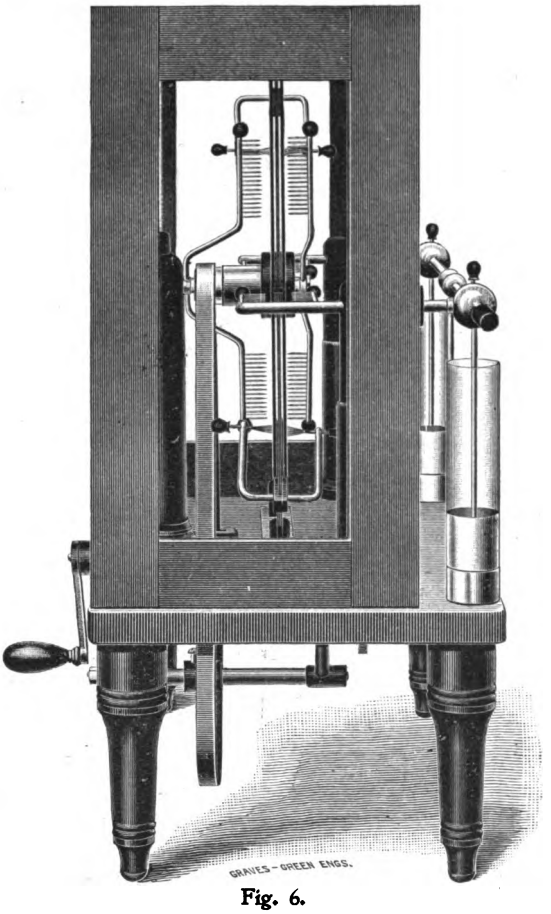

Fig. 6.

Economy.

2. The discharge from these machines does not heat the tubes appreciably; it does not require in tubes so high an exhaustion to begin with as is needed for coils, and it does not affect the condition of vacuum so readily as the current from Ruhmkorff and high frequency coils; it never burns out the terminals; it is not so liable to puncture tubes by external discharges.

Safety.

3. It does not generate a great excess of current which cannot be utilized in the Crookes tube. It is a feature of static machines in general that they give an oscillatory discharge of very high potential and an almost immeasurably small current, which is precisely the condition generally admitted to be required to produce the Roentgen ray effect. It is this quality of discharge that the various forms of coils strive to imitate but are never able to attain, excepting in the case of the high frequency or Tesla coils, which, however, greatly overdo the matter and have been generally abandoned in connection with x-ray production. *The malignant burns and other deleterious effects* which have been reported in connection with x-ray examinations and which should be attributed to the excess of electrical discharge and not to the x-rays themselves properly applied, *have resulted when coils have been used and not with static generators*, excepting possibly certain cases of excessive and unnecessary exposure. With these machines not only are the patient and operator protected from the so-called x-ray burns, but the terminals and conductors may be handled, if necessary, when the machine is charged without serious inconvenience. This is an advantage of no small moment.

Static machines do not burn the patient nor operator.

The New Holtz Machines, varying somewhat from the original design in some cases,

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are now offered for sale by several dealers in various parts of the United States. **The American Roentgen Ray Company** will furnish them, either directly or through its authorized agents, in *three sizes or styles*, made according to the *original designs* just described, with the latest minor improvements, and *guarantee them to be genuine in every respect.*

Headquarters for the genuine New Holtz Machines.

Style A.—The Standard. This has two rubber revolving discs. It was with this style of machine that the work illustrated in this circular was done. The "Standard" is recommended as the most generally useful of the three styles.

Style B. This has four rubber revolving discs. It is designed for therapeutical purposes; but it may be used for the excitation of Crookes tubes especially when unusually powerful x-ray effects are sought. It is believed to be equivalent to a twenty-four plate Toepler Holtz Machine of the form employing glass revolving discs.

Style C. This has a single rubber revolving disc and one glass armature plate. In all other respects it is the same as Style A. It is capable of producing good x-ray effects, but it requires longer exposures. It is recommended as entirely satisfactory for illustrative purposes; and it is undoubtedly the most efficient single plate static machine ever put upon the market.

V. Fluoroscopes.

Fluorescent substances.

The substance which fluoresces most brilliantly and with the best definition under the action of the Roentgen rays, so far as chemists have been able to determine, is barium platino-cyanide, freshly prepared and properly applied to the screen surface. This was the substance used for fluoroscopic tests by Roentgen in his investigations, and it has been employed by all his followers to a greater or less extent.

Barium platino-cyanide.

Not only does this substance give the most brilliant fluorescence, but it is practically non-phosphorescent; *i. e.*, when once excited it does not continue to emit light, even faintly, after the Roentgen rays have ceased to fall upon it. This quality of non-phosphorescence, it will be readily seen, is of great importance in cases where nice distinctions in detail or opacity are to be made out; for, if phosphorescence is likely to be present, it will be impossible to distinguish a faint shadow from an area which, though actually out of reach of the x-rays, may be faintly shining on account of previous excitation. For this reason surgeons need a non-phosphorescent fluoroscope.

Importance of non-phosphorescence.

Calcium tungstate.

No known substance, as has been implied, exceeds barium platino-cyanide, properly prepared, either in brilliancy or in the quality of non-phosphorescence; but there are certain difficulties in the way of its exclusive use for fluoroscopic screens. Its expensiveness and its tendency to easy decomposition, in common with all cyanides, are the principal drawbacks. Although both these objections have been largely overcome by the untiring labors of experimenters during the past year, so that a durable fluoroscopic screen of the platinum salt may now be obtained at a reasonable cost, there is still a demand for a less expensive screen, even at slight loss in brilliancy. Calcium tungstate is the only substance yet found to meet this requirement. The ordinary preparation of this salt gives a very brilliant fluorescence, and on account of its low cost is much used in making screens for exhibition purposes. But for the use of surgeons a non-phosphorescent preparation, first made by T. B. Kinraide of Jamaica Plain, has given excellent satisfaction. For a standard outfit we would recommend a small fluoroscope with barium platino-cyanide screen and a large fluoroscope having a screen coated with the non-phosphorescent preparation of calcium tungstate. It is well to have the large screen detachable so that it can be easily removed for exhibition purposes.

Non-phosphorescent substances.

Our recommendation.

Mounting.

The proper mounting of fluoroscopic screens is a matter not always given due consideration. The ordinary pyramidal box (see cut, outside cover) with a leather shield for the eyes is perhaps all that is needed for general use; but with such a mounting the

Fixed visual distance.

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Adjustable visual distance. visual distance is absolutely fixed. For a careful and accurate examination of delicate gradations or slight movements in shadow, with a screen capable of bringing out these finer details, it is essential to have a visual distance adjustable to the peculiar requirements for keen vision in the individual observer. The open box, with the head shielded by a black cloth, meets this need to a certain degree. But a more convenient arrangement is illustrated in Fig. 7. The screen is attached to a camera bellows which may be easily opened or closed. The shield for the eyes is held in position by a stout elastic band slipped over the head. This allows an easy movement of the head towards the screen or away from it, in order that the best visual distance in each case may be found. When folded up, the instrument makes a parcel about one inch thick and may therefore be carried about conveniently.

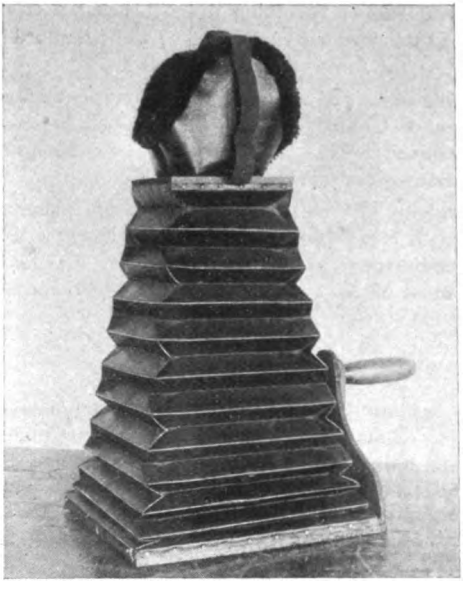

Fig. 7.

The diaphragm screen. Another important accessory to the proper fluoroscopic outfit is some arrangement for cutting off the x-rays from all portions of the screen excepting the one area, small it may be, where a particular detail is to be examined. Many observers have failed to see the finer shadows that are really present on account of the general glare of the screen. This is easily remedied by employing a diaphragm of sheet brass so constructed that it may be placed in front of the fluoroscopic screen, with its opening, which may be varied in size, over the part where the examination is to be made.

VI. Roentgen Ray Photography.

The requirements for Roentgen ray photography are of the simplest sort. Probably any kind of a photographic plate or film will serve the purpose. Bromide paper has been successfully employed with the advantage of giving a positive when developed. Both films and sensitized paper admit of easy duplication, since a large number, an entire package for example, may be exposed at the same time without removing them from their paper covers. In using plates it is necessary to make individual exposures on account of the opacity of glass to x-rays. For this purpose plates are put up in individual wrappers with the film sides marked, so that it is not necessary to use plate holders. Many, however, prefer the latter, as they protect the plates from breaking. The relative positions of the tube, plate and object to be skiagraphed are illustrated in plate VIII, which shows a simple method of making a skiagraph of the hand. The plate holder having been loaded with a single plate, film side outward, as for ordinary photography, the hand is placed directly on the slide, which protects the film from the light but not from the x-rays. The rays from the Crookes tube fall upon the sensitive film affecting it in the same manner as light, excepting where they are cut off or absorbed, partially or wholly, by some object more or less opaque to them, in which case the integrity of the silver salt is, to a greater or less extent, preserved. After a sufficient exposure the plate is developed and fixed as in ordinary photography. The result is a shadow picture or skiagraph of

Character of the picture.

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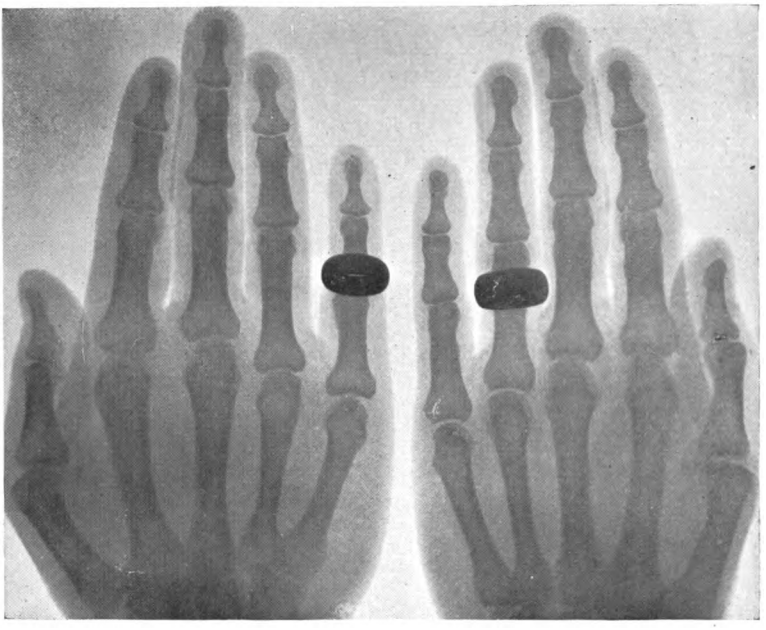
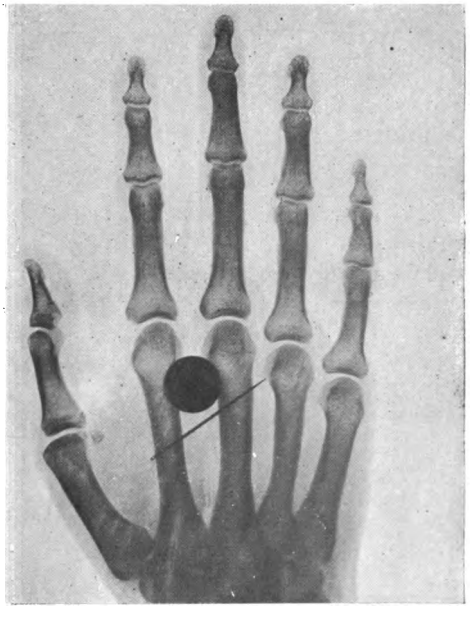


Skiagraph of two hands: illustrating clear definition.



Needle and coin under a hand. Note eye and point of the needle as an evidence of clear definition.

Skiagraph of a hand made in *two seconds*. A fluorescent screen was used on the right side. Note the increased contrast between bone and flesh

COPIES OF SKIAGRAPHS ILLUSTRATING DEFINITION.

PLATE VII.

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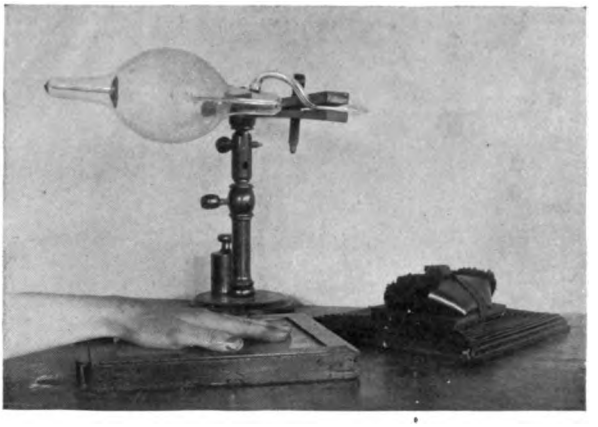
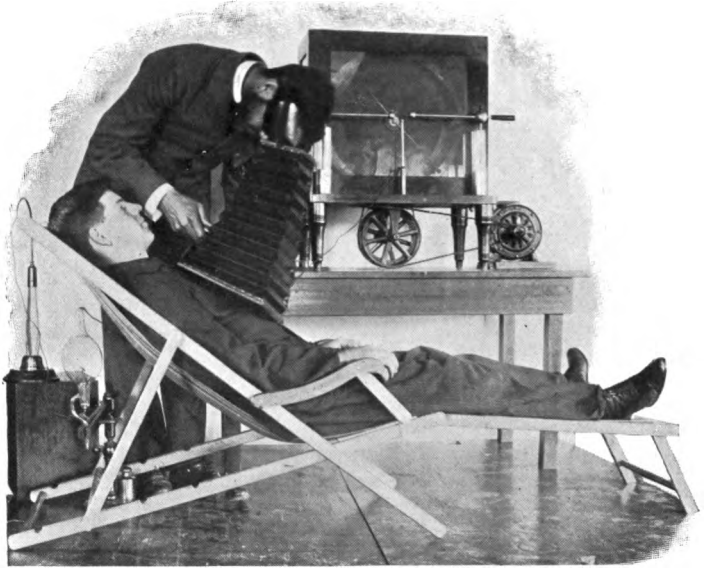


The relative position of tube, plate and object.
Fluoroscope folded up.



The method of using the fluoroscope.

METHODS OF EXPOSURE.

PLATE VIII.

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the opaque parts of the object laid on the slide. The picture is slightly larger than the object because the rays concerned in producing it radiate from a portion of the anode of the tube much smaller than the object or parts of the object casting the shadow. By bringing the object nearer the picture may be made still larger, and, if too near, it will be distorted. The proper distance of the tube from the plate will depend upon the size and shape of the object to be skiagraphed. For the hand or teeth, six to ten inches is a good distance; for the knee or foot, ten to fourteen inches; for the various parts of the trunk, fifteen to thirty inches. It is well not to bring the tube so near to the flesh, especially the sensitive parts, that the electrical discharges from the tube may be felt. Neglect of this caution has caused the burns attributed (not by experts) to the Roentgen rays. It is particularly necessary to keep the tube at a proper distance when using a coil.

Distance of tube from plate.

Time of exposure.

The time required to make a fully exposed x-ray negative depends upon so many varying conditions that it is impossible to lay down definite rules. It depends, in general, upon the intensity of the rays as they fall upon the plate; and the intensity is variously modified. The following general principles embody some of the conditions which must be kept in mind: —

General principles.

1. The intensity of the x-rays, since they radiate from a small area or point on the anode, varies inversely as the square of the distance. If an exposure of one minute will suffice with the plate six inches from the anode, an exposure of four minutes will be required when the plate is one foot away, other things equal.

Distance.

2. The intensity of the x-rays is variously reduced by the thickness of materials through which they must pass to reach the photographic plate. This is evidently due to absorption which varies with different substances. Experience must be the guide in this matter. Not only the bones but the thicker parts of the flesh and the vital organs greatly diminish the power of the rays to affect the film. In making skiagraphs of these parts the plate is in no danger of over-exposure.

Absorption.

3. The intensity of the x-rays varies with the kind of generator used to excite the vacuum tube, with the changes in the condition of the same generator, with the condition of the atmosphere, whatever the kind of generator used, and with the changes in the condition of vacuum. Here, again, experience is the only safe guide. One fact, however, is well established, namely, that a comparatively low vacuum tube, of the best x-ray type, affects a photographic plate more powerfully than those of higher exhaustion. The latter are necessary for great penetration, but they lose in intensity as measured by the photographic test. The margin of a plate exposed for a hand one minute with a low tube will often develop as dense as the freely exposed part of a plate kept under a higher tube a much longer time and at the same distance in making a skiagraph of a knee. *This is a suggestive fact to those who wish to compare static machines with coils for x-ray work, inasmuch as it is well known that coils require higher vacua than the statical generators.*

Tubes lose in photographic power as they run higher.

Tubes pumped for static machines have greater photographic power.

4. For the New Holtz Machines a general rule may be derived from the following table: —

For	the	hand	from	1	minute to	3	minutes.
"	"	arm	"	2	" "	6	"
"	"	ankle	"	2	" "	10	"
"	"	knee	"	5	" "	15	"
"	"	thorax	"	10	" "	30	"
"	"	pelvis	"	15	" "	40	"
"	"	thigh	"	15	" "	40	"
"	"	shoulder	"	15	" "	40	"

5. The foregoing table is based upon experiments in which no device has been employed to hasten the photographic effect. But if a properly constructed fluorescent

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How the time of exposure may be greatly lessened.

screen be laid over the photographic film and the exposure made as before, the time may be reduced, generally speaking, from minutes to seconds. There is a slight loss in definition resulting from the use of this method; but, notwithstanding this, it is an invaluable aid in many cases.

Development of x-ray plates.

The illustrations in this pamphlet are from x-ray photographs made upon Stanley dry plates, No. 50 (sensitometer). Experience has taught us that harsh development is preferable. For this purpose nothing excels the ordinary pyro-developer, particularly with the Stanley dry plates. A little longer time, generally, is required than for light exposed plates. Some observers have suggested that the maximum x-ray effect is to be found on the side of the film next the glass. This may account for the longer time required for development.

Only ordinary care required.

No greater care need be exercised with x-ray plates than is essential for ordinarily good work in amateur photography. Dealers in photographic materials will willingly furnish needed information on this point.

A FEW SURGICAL CASES IN WHICH THE NEW HOLTZ MACHINE WAS USED.

Nos. 37, 38 and 39. Fractured tibia and ankle, for Dr. Allen, of Arlington.

Nos. 42 and 44. Examination of knees for tuberculous condition, for Dr. C. F. Nichols, of Boston.

Nos. 52 and 53. Lame knee, for Dr. C. F. Nichols, of Boston.

Nos. 56, 57, etc. Fractured tibia of foot ball player, for Dr. F. W. Taylor, of Cambridge. Several sets of skiagraphs of this case were made at intervals of a week while the leg was in plaster cast. (See Plate IV).

No. 60. Injured thumb, for Dr. H. O. Marcy, of Boston and Cambridge.

No. 62. Pelvis of child, for Dr. W. J. Winn, of Cambridge.

Nos. 66 and 67. Needle imbedded in partella of a child, for Dr. Carr, of East Cambridge.

No. 68. Needle in a finger, for Dr. Cunningham, of East Cambridge.

Nos. 69 and 70. Pelvis — hip disease of long standing — for Dr. Driver, of Cambridge.

No. 77. Injured finger for Dr. G. B. Henshaw, of Cambridge.

Nos. 89 and 90. Compound fracture of humerus and femur, for Dr. G. B. Henshaw, of Cambridge.

No. 95. Sprained elbow joint, for Dr. J. T. Nichols, of Cambridge. (See Plate III).

No. 98. Needle in hand, for Dr. MacKechnie, of Somerville.

No. 120. Base ball finger, for Dr. Geo. P. Cogswell, of Cambridge.

No. 125. Fracture of metatarsal for Dr. Eugene A. Darling, Cambridge.

No. 130. Child supposed to have swallowed a McKinley button.

No. 158. Fractured tibia and fibula, for Dr. H. O. Marcy, Boston and Cambridge.

No. 161. Tuberculous knee, for Dr. Tuttle, of Cambridge.

Nos. 179 to 184. Six plates of leg of motorman injured in Boston Subway explosion, March 4, 1897, for Dr. H. B. McIntire.

Nos. 192 to 195. Dental examinations for Dr. Geo. R. Taft, Cambridge, Mass.

No. 203. Bullet in breastbone. Case of Smith, for Dr. F. W. Taylor, of Cambridge. (See Plate II).

No. 205. Bullet in groin, case of U. S. Blake, of Dorchester, for Dr. Geo. B. Henshaw, of Cambridge.

No. 225. Case of periostitis, for Dr. H. O. Marcy, Boston.

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SOME OF THE PURCHASERS OF THE NEW HOLTZ.

The following list of Educational Institutions, Hospitals, Physicians, and other parties, selected from those that have been supplied, will show the character of the purchasers and range of our sales.

Educational Institutions.

Acadia College, Wolfville, N. S.; Adelphi College, Brooklyn, N. Y.; Atlanta University, Atlanta, Ga.; Bowdoin College, Brunswick, Me.; Brown University, Providence, R. I.; Cambridge Manual Training School, Cambridge, Mass.; Colby University, Waterville, Me.; Cook Academy, Montour Falls, N. Y.; Cushing Academy, Ashburnham, Mass.; Dedham High School, Dedham, Mass.; Elmira College, Elmira, N. Y.; East Side High School, Milwaukee, Wis.; Farmington Normal School, Farmington, Me.; Fitchburg Normal School, Fitchburg, Mass.; Haverford College, Haverford, Pa.; Manual Training High School, Brooklyn, N. Y.; Massachusetts Institute of Technology, Boston, Mass.; Mechanic Arts High School, Boston, Mass.; Miami University, Oxford, Ohio; North Carolina Medical College, Davidson, N. C.; Phillips Academy, Andover, Mass.; St. Benedict's College, Newark, N. J.; University of Michigan, Grand Rapids, Mich.; University of Oregon, Eugene, Or.; University of North Carolina, Chapel Hill, N. C.; University of Tennessee, Knoxville, Tenn.; Washington and Lee University, Lexington, Va.; Western Reserve University, Cleveland, Ohio; Williston Seminary, Easthampton, Mass.; Worcester Polytechnic Institute, Worcester, Mass.; Worcester English High School, Worcester, Mass.

Hospitals.

Arnott Hospital, Elmira, N. Y.; Emergency Hospital, Boston, Mass.; Newton City Hospital, Newton, Mass.; St. Luke's Hospital, Utica, N. Y.; Waltham Hospital, Waltham, Mass.

Physicians and Surgeons.

Dr. H. R. Ainsworth, Addison, N. Y.; Dr. A. B. Briggs, Ashaway, R. I.; Dr. D. M. Clapp, Boston, Mass.; Dr. Thos. Conant, Gloucester, Mass.; Dr. N. R. Hall, Warren, R. I.; Dr. Geo. B. Henshaw, Cambridge, Mass.; Dr. C. W. Hoyt, Corning, N. Y.; Dr. W. E. Hibbard, Providence, R. I.; Dr. M. A. Hudson, LaFayette, Ala.; Dr. C. P. Jones, Southboro, Mass.; Dr. Geo. H. Matchett, McPherson, Kan.; Dr. J. H. Mudgett, E. Barrington, N. H.; Dr. John H. Neal, Rochester, N. H.; Dr. A. G. Nye, Weymouth, Mass.; Dr. Mark S. Purdy, Corning, N. Y.; Dr. F. T. Rogers, Providence, R. I.; Dr. Frank W. Ross, Elmira, N. Y.; Dr. C. L. Squire, Elmira, N. Y.; Dr. Roswell Wetherbee, Cambridge, Mass.; Dr. O. B. Will, Peoria, Ill.

Other Parties.

R. N. Davis, Archibald, Pa.; Henry Greene Co., Hartford, Conn.; C. A. B. Halverson, Saugus, Mass.; Ernest H. Lewis, St. Albans, Vt.; C. A. Page, Methuen, Mass.; F. W. Traphagen, Bozeman, Mont.

There are many others and the list is constantly growing.

NET PRICES.

Style A, (The "Standard") $45.00; or $50.00 with Crookes tube
Style B, . . Price on application.
Style C, . . $30.00; or $35.00 " " "
Crookes Tubes, $5.00 and upwards according to style and size
Fluoroscopes, $5.00 " " " " "
Ruhmkorff Coils at reasonable cost.

A full line of Accessories at lowest prices. For details, consult the Price List of the American Roentgen Ray Company.

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TESTIMONIALS.

From an Eminent Surgeon of Boston:

180 Commonwealth Ave., Boston, Sept. 22, 1897.

Dear Mr. Warner: — Let me thank you for excellent service. I take pleasure in commending your work. Sincerely, HENRY O. MARCY.

From Professor Trowbridge, of Harvard University, referring to work done by the New Holtz Machine.

I am very much obliged for the superb photographs you kindly sent me. They are the best I have seen and I shall greatly enjoy showing them to my friends.

From Professor H. C. Bumpus, of Brown University:

I consider your Static Machine the most satisfactory instrument for the production of x-rays now on the market.

From Prof. Chas. R. Cross, of Massachusetts Institute of Technology:

I have made frequent use of the machine, and find it very efficient and thoroughly reliable.

From Prof. C. C. Hutchins, Bowdoin College, Brunswick, Me.:

The machine works all right; has never reversed or refused to start.

From Prof. D. R. Ford, of Elmira College, Elmira, N. Y.

At a recent meeting of the Elmira Academy of Sciences, we had three of your machines in operation, with great success, before an audience of 1,000 people.

From Prof. Frank P. Whitman, of Western Reserve University:

The Holtz Machine and fittings have been received, set up and tried. There is no doubt about the excellence of the results, which are fully comparable with what I have been able to obtain from a 12-inch coil. . . It may be of interest to say that I have obtained with your machine excellent fluoroscopic effects through the adult human body, showing the beating of the heart, the movement of the diaphragm, etc. . . You have certainly produced an excellent machine and one which is mechanically so much better than the ordinary ones, that I should think it would commend itself to schools, not only for x-ray work, but all other work for which a static machine is useful.

From Dr. F. T. Rogers, Providence, R. I.:

I have used the new x-ray machine for some months and find it very satisfactory. I do not believe there is anything better made.

From G. B. Henshaw, M.D., Cambridge, Mass.

I desire to express to you my thorough satisfaction and delight with the work done by your Holtz machine. As an aid to the diagnosis and treatment of recent or old fractures, dislocations, deformities, and new growths, from a surgical standpoint, and a revelation of the condition of the lungs, heart, liver, abdomen and pelvis from a medical point of view, the work you have already done with the machine has proved that the x-ray is indispensable to the busy practitioner in his daily work.

From Dr. Frank W. Ross, Elmira, N. Y.

The apparatus — New Holtz — arrived to-day in good order. I have set it up, and it works beautifully. Had a 7 1-2 inch spark to-night, and think I might have gotten an eight. . . . I can only repeat my former statements in praise of the apparatus.

From Dr. H. R. Ainsworth, Addison, N. Y.

Let me say that I congratulate myself upon having so complete an outfit, working as it does, charmingly.

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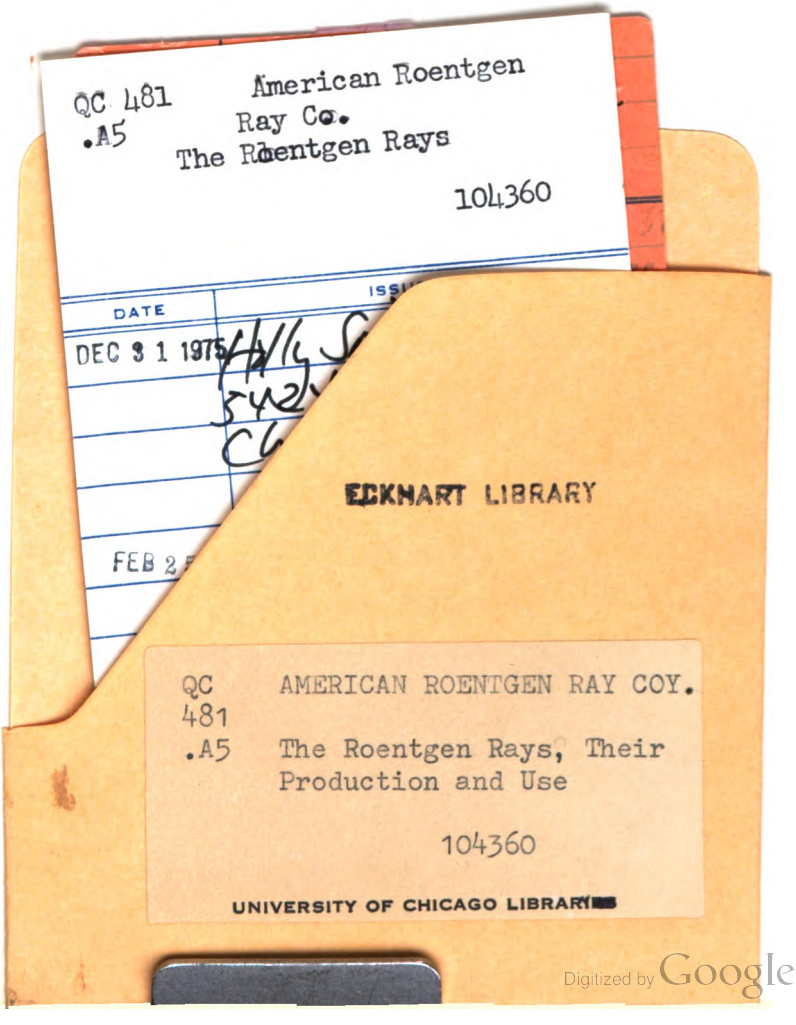

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